INSIDE: SYLLABUS CONFERENCE UPDATE

Syllabus

TECHNOLOGY FOR HIGHER EDUCATION

JUNE 2002 • VOLUME 15, NO. 11

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The Interactive Campus

New Media for Teaching and Administrat

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EDITOR'S NOTE

Mary Grush, Editor

Get out your digital camera and focus your networked projector! In this issue we try to capture a sharper image of today's interactive campus—and anticipate tomorrow's. There are countless digital technologies, from digital imaging to streaming audio and video; from large electronic whiteboards to tiny handheld PDAs with color displays. Devices can be connected on wired or wireless networks, and multiple users can be conferenced for collaborative work. Remote learners can access vivid multimedia course materials and keep up with class activities asynchronously on the Web. Colleges and universities are investing more dollars than ever before in hardware, software, and integrated systems for their academic and administrative departments. But are all these new media being used primarily to enhance presentation? *Syllabus* interviewed Chris Dede (page 12), technology futurist and Harvard University's Timothy E. Wirth Professor of Learning Technologies, for his views on how emerging media may be used—eventually—to achieve a richer, more interactive educational environment.

Many institutions rely on vendors for stable administrative and course management systems, as well as for the infrastructure on which these systems ride. In "The Interactive Campus: Administrative and Course Management System Vendors Take Up the Challenge" (page 16), we asked the leadership of seven companies to reflect on their plans for new media and highly interactive technologies.

Also in this issue, you'll find some concrete examples of how digital imaging (pages 30 and 32) and instructional video technologies (page 34) are implemented on campus. And, we've included a presentation technologies guide (page 42) to highlight a few of the newest education products.

How do you integrate presentation and interaction in the summer, when you're not at school? By attending the annual Syllabus conference! Each year, several hundred administrators, IT professionals, and faculty practitioners meet in Santa Clara, Calif., to exchange information on the use of technology in higher education. The upcoming conference will be held July 29-31, with pre-conference workshops and seminars on July 27-28.

This year, our six tracks are augmented by six highly interactive sessions featuring invited speakers and panelists selected by our Syllabus conference program board. Each board member will moderate a session on a topic that they strongly feel is important to attendees and merits extended discussion. Topics range from "Connecting Everyone—Accessibility in Action" to "Major Technology Initiatives at Research Universities." On page 27, you'll find a Syllabus2002 Conference Update section with details on the board's invited sessions and newly released information about our three keynotes. For full, descriptive information about all conference sessions, biographical information about presenters, and registration information, visit www.syllabus.com.

Have you considered presenting at a Syllabus conference? Watch our Web site for the Call for Papers for our East Coast conference, Syllabus fall2002. Attend the summer conference, and present in the fall!

Enjoy this issue of *Syllabus!*

Mary Grush

Letters to the editor should be addressed to the editor and sent to 101 First Street, #605, Los Altos, CA 94022, or via electronic mail. We reserve the right to edit all submissions. **News and product information** will be considered for publication. Please send all materials to Paul McCloskey. If you are interested in writing for *Syllabus*, please send a brief description of your article idea along with writing samples to the editor at the above address.

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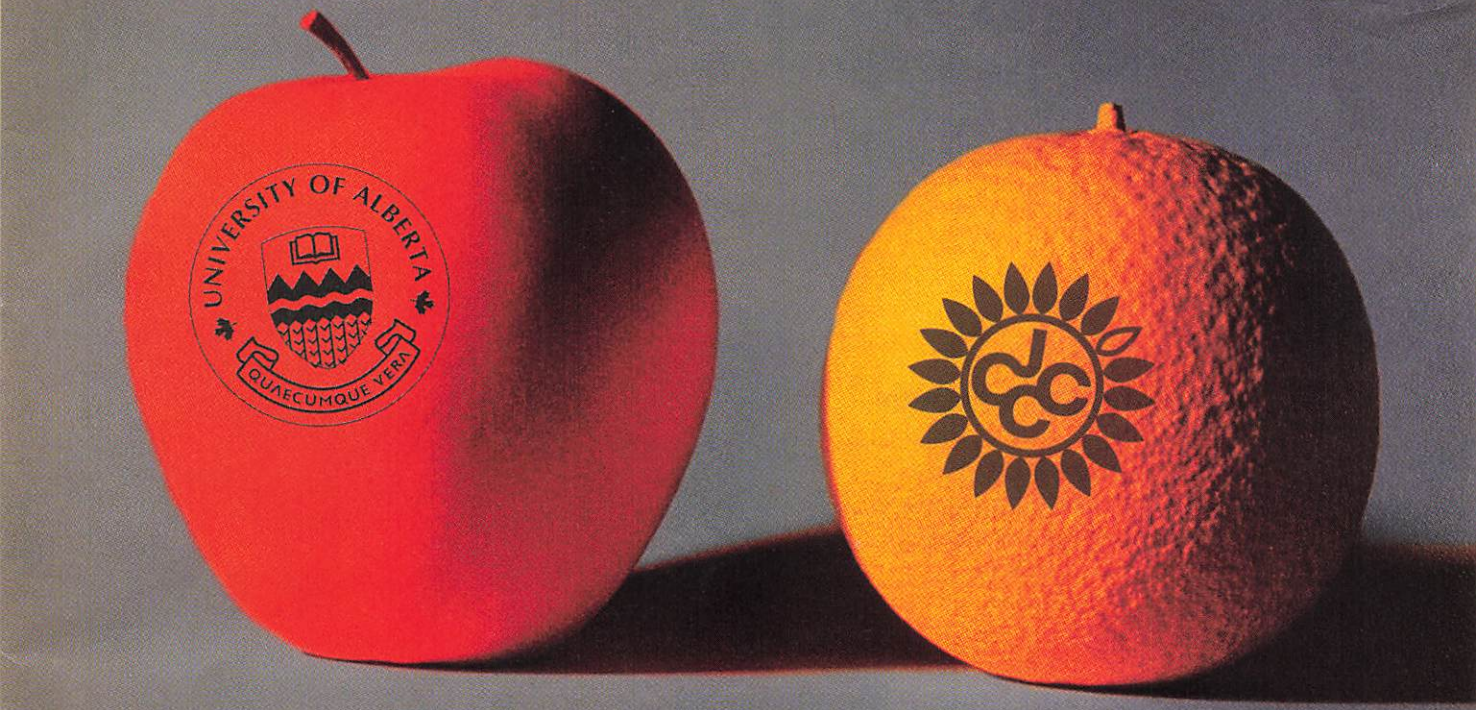

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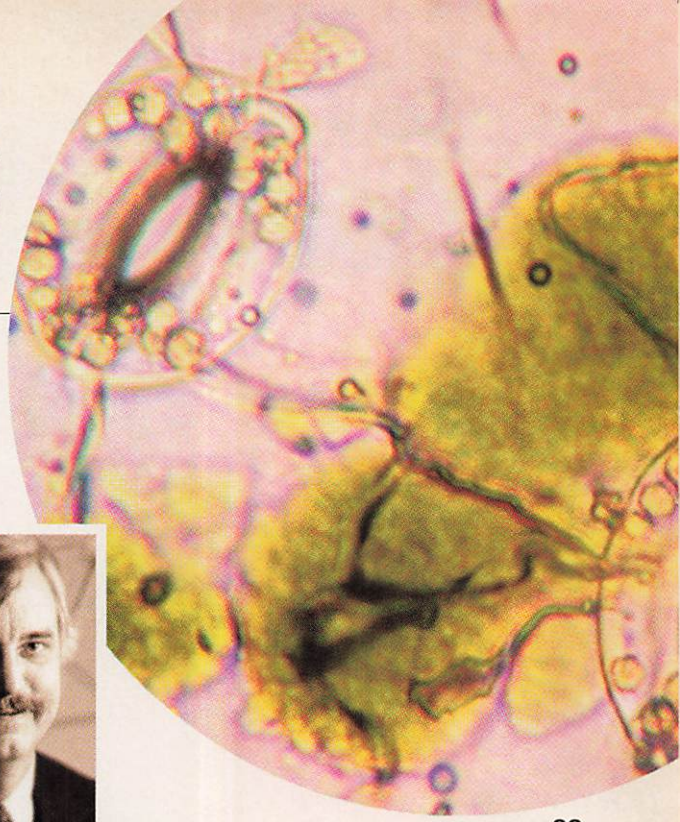

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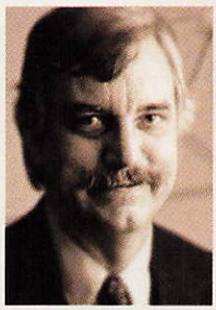

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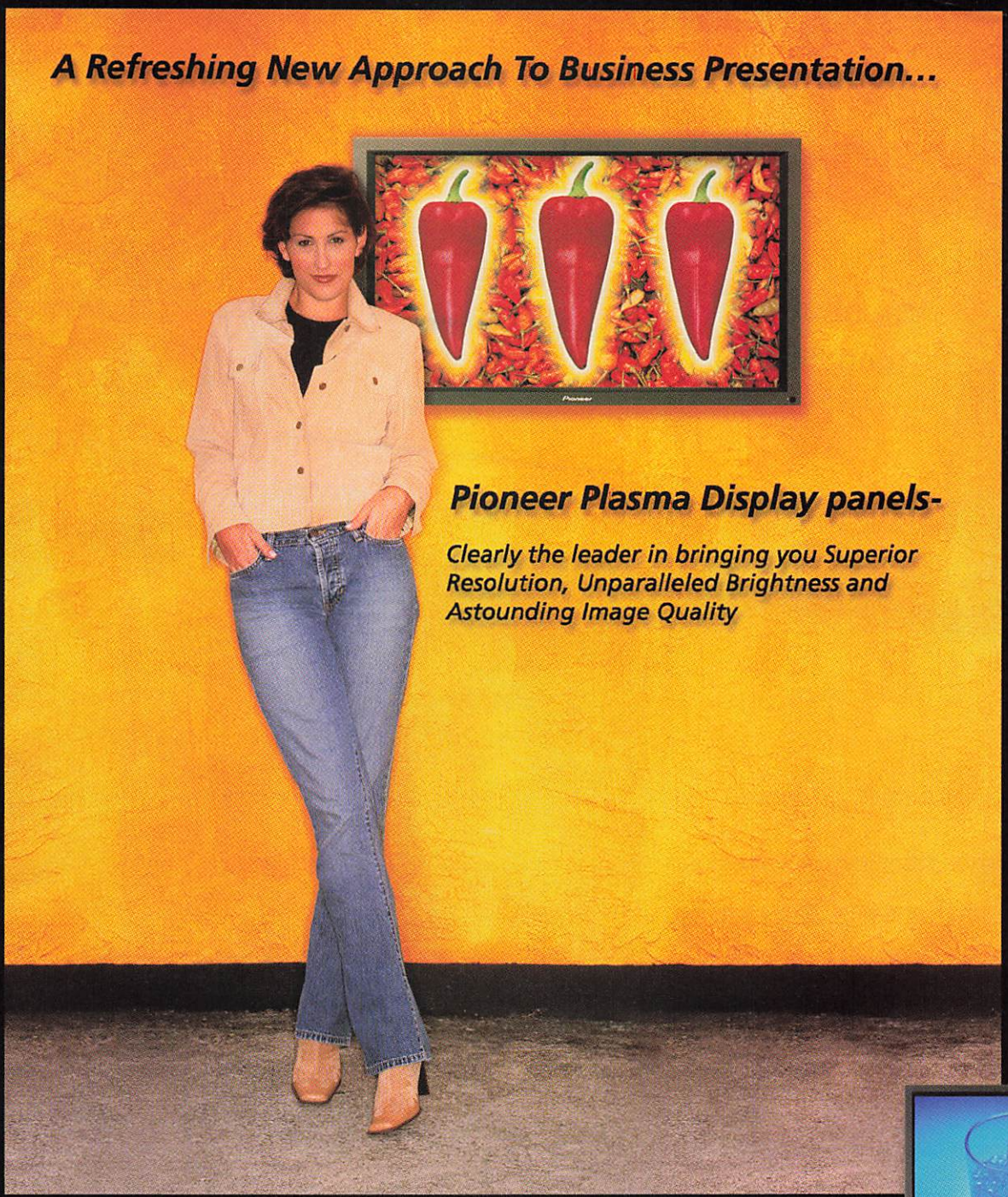

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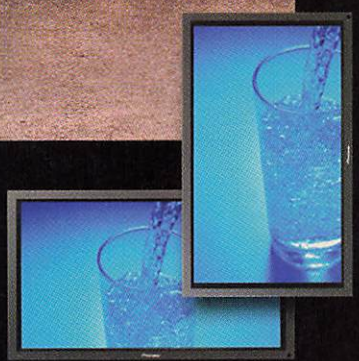

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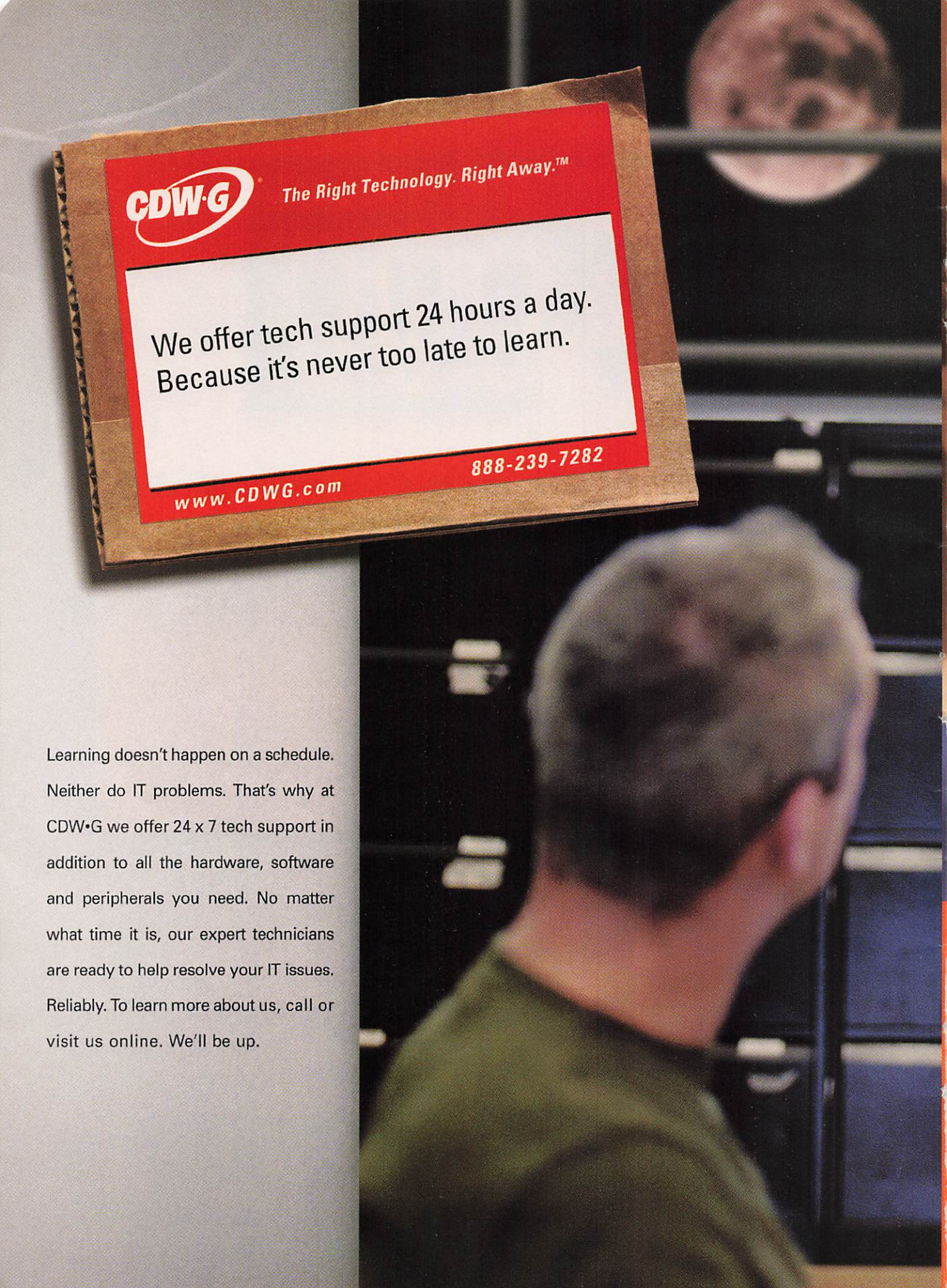

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Phillip D. Long

Phillip D. Long is senior strategist for the Academic Computing Enterprise at MIT. He is also a senior associate for the TLT Group of the American Association for Higher Education. longpd@mit.edu

TRENDS

AN INFORMATION RESOURCE OF INTEREST TO EDUCATORS

Briefs

- Membership is building in HEKATE, the **Higher Education Knowledge and Technology Exchange**, an association formed to exchange ideas between universities and industry on technology in learning.
- **Harvard Medical School** students will be able to download course information and other medical applications via their personal digital assistants through a recently installed wireless infrared system.
- **Apple Computer Inc.** unveiled the eMac, a desktop line designed for the education market with a 17-inch flat CRT screen and 700 MHz PowerPC G4 processor.
- **California State University** launched a university-wide knowledge management initiative.

For these and other news stories, or to subscribe to the weekly Syllabus e-News, Resources, and Trends, visit www.syllabus.com.

Augmented Reality: Metadata and Annotating Life

You've seen examples of Augmented Reality (AR) though you might not have recognized them. Through virtual product placement in movies, advertisements are added after scenes are shot, creating new revenue opportunities. On the auto racing circuit this past season, as Fox Sports televised cars racing around the track, balloon overlays showed the drivers' names. During last season's televised pro football broadcasts, a yellow line indicated the first-down marker on the field. The offensive team lined up on the ball, and there, somewhere ahead of them, was a bright yellow line showing viewers how far the team had to go to make the next first down. It's quite helpful. Too bad players can't look downfield and see how far they have to go as well.

Fox Sports televised auto races with balloon overlays showing the drivers' names.

The projection of the first-down maker onto the field seems so realistic that it appears to be part of the field. Players' shadows fall on the line, and bodies crossing it obscure it. However, the limitations are humorously revealed when a game is played under conditions programmers didn't count on. Last season a game took place between the New England Patriots and the Oakland Raiders during a driving snowstorm at Foxborough Stadium, home of the Patriots. Apparently the algorithm for calculating the placement of the yellow line on the field depended on the expectation that the background would be green, or at least some color. In the near-blinding snow, the field was pure white. In fact, the grounds crew had to line up on each 10 yard line with snow blowers to clear the down markers between plays so the players and referees knew where they were on the field. To television viewers, the yellow line seemed to go crazy. It stair-stepped over the players who crossed it, creating crazy yellow cityscapes jutting out of the ground.

While the commercial examples above are more widely known, the majority of AR research is done using see-through devices. Usually worn on the head, these devices are designed to superimpose graphics or text onto a user's perception of his or her surroundings. The reality augmentation is not limited to visual information, but can include auditory and tactile sensory systems as well.

In fact, the work in AR is a precursor of future user interface design. We're accustomed to think of future user interfaces in terms of new flat-panel screens, wrist displays, or various surfaces with interactive displays. But changes will affect the nature of the user experience with technology, integrating information from a variety of sources into the user's perception. The difference between a future emphasis on different display technologies and AR is in the cognitive effort that AR attempts to minimize by eliminating the need for users to switch between reading computer information on one screen and then switching back to the perceptual reality around them. The goal is to make the computerized information a part of the user's view of the world.

This may sound like *Star Trek*, but the work in this field can be traced back 34 years to the pioneering efforts of Ivan Sutherland at Harvard

Video clip courtesy of Fox Sports

University. The fundamentals of the technology required to build integrated display environments have remained largely unchanged, requiring displays, trackers, and graphics computers and software. What has changed is that the technology for each of these components has drastically improved.

The approaches to integrating computer information into the user's perceptual field have taken two directions, both of which use see-through devices. One is optical, the other is video-based. In optical see-through devices, computer data is split by a mirror beam that both reflects and transmits light, letting the view of the world combine with the computer data images. Combiners of this sort are the basis for the heads-up displays in aircraft cockpits and, recently, some models of automobiles.

The other approach involves video mixing technology that takes images from a camera and adds computer graphics and text. The key difference is that the user is looking at a synthesized image in video-based devices instead of seeing the world augmented by computer-generated overlays. In current see-through display devices, superimposed text may be hard to read against some backgrounds, and the three-dimensional graphics may not produce realistic images. More challenging is bringing the virtual and physical images together in the same plane of focus.

Research to date has concentrated on improving the presentation of visual data—for example, controlling the data generated onto the human visual field so that items remain in focus and within the same plane as the primary object being viewed. However, there is perhaps even more rewarding work ahead in examining the cognitive circumstances that provide augmented understanding of a scene at hand—that is, what type and in what context should information be provided to improve the user experience? Imagine walking down the street in a city you are visiting with a pair of sunglasses that have an embedded see-through display. As you pass by restaurants, the Zagat rating of each appears adjacent to the restaurant's name. What other information do you want? Do you want to see the menu? Perhaps the average price of selected entrees based on a profile of your favorite foods? Knowing what is going to improve your contextual understanding of the setting you are in—and how to present it—is work that is just beginning.

The technology is rapidly improving. New see-through devices are using lasers to project computer data directly onto a user's retina. The other research direction involves improving the projection of images onto surfaces. Application areas are numerous. Surgeons are starting to experiment with biopsy procedures augmented with see-through displays that integrate ultrasound information into the surgical procedure. In manufacturing, assembling complex systems (aircraft, automobiles) and repairing them are ripe for AR. Finally, teaching with AR takes the notion of scaffolding learning constructs to a new level.

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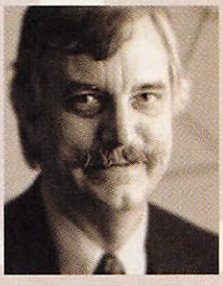
Interactive Media in

An Interview with Chris Dede

New interactive media are being embraced both on campus and for distance education, but are we really using these technologies to our best advantage? What does the future hold for educators who use these media? *Syllabus* interviewed Chris Dede, Harvard University's Timothy E. Wirth professor in the Graduate School of Education, to find out.

S: You've said that new interactive media are not necessarily being used in the best ways possible. There's a lot of amazing new technology out there, but what do you see as the areas we should be concerned about, in terms of how it is used?

CD: A lot of people—including myself—are disturbed by what we see happening in the current educational "reform" movement. There's a tremendous amount of testing for accountability at the pre-college level, and there's also an increasing emphasis on this type of evaluation for learning in college. Mandating superficial coverage of large amounts of low-level information and procedures creates pressure to use technology merely to deliver content—a sort of "teaching by telling" and "learning by listening." But if learning via technology is all presentation, or even all simulation, then it's not very powerful because this is passive assimilation rather than active construction of knowledge. And while many people are claiming that streaming lectures via Web casts and downloading presentational materials from archives somehow makes learning much better, we have many reasons to believe that's just not true.



S: Okay, so there's just presenting information and then testing on it—that's like rote and drill. Is the need for accountability driving this?

CD: While I think accountability is a very good idea, often it's expressed in a way that brings out the worst in teaching rather than the best. Students can do okay on a test as long as we give the test right away rather than a year later. Presentation as a primary method of teaching has a number of problems associated with it, in terms of motivation, what students can comprehend, how long they remember the material, and whether or not they can transfer and generalize it. And yet, when we look at the uses of technology in education today, a tremendous number of them are presentational—coating data with multimedia so that it slips into people's minds more easily, then using automated testing systems to quickly pull it back out again so that we can document that "learning" has taken place.

S: I think most people would agree that there are more interesting applications than that.

CD: What's frustrating about all this is that the technology is really capable of quite a bit more. And we are facing a time in which the limits of presentational instruction are highlighted by the challenges that we have in preparing students for the 21st century. You know, as a member of the *Leave It to Beaver* generation, I was brought up in a very different time. I was prepared for what people thought would be a mature industrial economy. As a result of that missed forecast, I learned a bunch of things in school that are obsolete now.

S: For example?

CD: For example, I learned a kind of decision-making that I never use. I learned that, to solve problems, you study the situation until you understand it thoroughly, go to your repertoire of standard problem-solving techniques, pull out the right mixture, and then apply some kind of a synthesis of those solutions and your problem is solved. Of course, today you and I face a very different kind of work life. We're constantly faced with novel situations that nobody has ever seen before. If we wait until we understand them thoroughly, it's much too late to act, because the challenge has already "morphed," changed into something else. The pace of the world is so fast that we don't have the luxury of completely understanding what we're facing, and we have to act on the basis of incomplete information.

S: That's true!
CD: It's going to be true for this whole next generation of students who are facing a 21st century world driven by information technologies, and increasingly biotechnologies, moving things forward very rapidly. Another thing I learned in my education was individual competition. That's certainly still very valuable, but I didn't learn teamwork and collaboration. And yet group efforts are at the heart of a lot of the modern workplace, as you know.

S: And what about skills for the information age?
CD: Well, yes, I learned how to find information when I went to school. Of course, today in 15 seconds on the Web either of us can find 200 things we could probably use. But we've only got the time and energy to deal with five or six. So now we've got to filter instead of find—a very different and more complex set of skills. And, in contrast to the kind of education reform that we're living through, the point that I want to make is: It isn't just achieving traditional educational outcomes better, it's giving students a whole different set of knowledge and skills. We can't say to ourselves, well, if we can just raise everybody's test scores 100 points, we'll be fine. Because the fact of the matter is, there is an entire set of higher-order cognitive and affective and social skills that has never been as important before in human history as now, and this is central in preparing learners for the 21st century.

S: So I hope you are going to tell me now that new interactive media do indeed apply here?
CD: We're facing the biggest gap between yesterday's workplace and tomorrow's that any group of educators have faced since the dawn of the Industrial Revolution a couple of centuries ago. And yet the very technologies that are creating this challenge are also providing an opportunity to meet it. In contrast to simply automating presentation, there's a lot that interactive learning technologies can do to address more powerful forms of pedagogy—based on learning by doing, collaborative learning, and mentoring via apprenticeships. All these instructional approaches let students act rather than listen, do things inside the technology world that are impossible in the real world, and link to outside resources and communities of practice. So yes, new interactive media give us a kind of opportunity that educational technologies have not had until now—a chance to change our pedagogy in ways that really open up powerful content to students.

S: What is it about new interactive media that will give us this chance—what is the characteristic of these media that is most important?
CD: What is a medium? Partly, it's a channel, and that's what everyone is excited about. That's what all the hype is about. People are tremendously excited about the fact that we can reach almost anybody, anyplace, anytime. But what we miss about media is that they are also representational containers—that is, they shape not only whom we can reach, but what we can say. A simple example is that we say a picture is worth a thousand words. What that means is that some kinds of representations are better at conveying a particular type of meaning than other kinds of representations. I can try to describe my office to you and spend 15 or 20 minutes painting a verbal picture. Or I can show you an image and, in about three seconds, you'll have a sense of what my office looks like—much better than the verbal pictures could convey.

S: Will we be communicating new types of information that can only be expressed with the new media—so in a sense our conversation would be limited or nonexistent in certain areas if we didn't have these media?
CD: Representations shape what we can think and what we can do. In his novel *1984,* George Orwell wrote about a ruling class that was simplifying the language by removing words like *freedom.* Because, if you don't have a way to articulate a concept to yourself or express it to others, it becomes much harder to find a way to act on it. What the new media are doing is the opposite of what happened in *1984.* By adding new kinds of representations, they are unobtrusively widening the range of messages and meanings that we communicate with our students.

S: And what about the role of the Internet and the new types of interactions going on there?
CD: Well, even the metaphor of the channel is falling apart because the channels are so big now that we ourselves are inside them. There's a place called cyberspace where many of us spend a little time, and some of our students spend a great deal of their time, in contrast to real-world settings. Understanding what those virtual settings are like and what they're good for is extremely important. Isaac Asimov once said that the important thing to forecast is not the television, but the soap opera. In the same way, the important thing to forecast is not the channels, it's not the boxes and wires and switches, but instead it's the way that we can now sense and act and learn almost magically across distance and time, and what that means for our human capabilities in terms of teaching and learning.

S: What kinds of interactive technologies will have the most impact in the future?
CD: There are three kinds of interfaces for distributed interaction that are going to become increasingly important over the next 10 years or so. Those three kinds of interfaces complement one another in terms of moving to the sophisticated pedagogies for 21st century skills. The first is the notion of bringing "the world to the desktop." Broadband and collaboration technologies are becoming much more powerful, enabling increased interaction with distant experts and archives. Associated capabilities are speech recognition, telepresence, and teleoperation technologies. In contrast, the second interface is ubiquitous computing via wearable wireless devices. The metaphor is not sitting somewhere and having the technology bring things to you, but instead being able to wander through the world doing whatever things you do in the real world, with the virtual world superimposed through "smart objects" and "intelligent contexts." And the third interface is the user being inside a virtual context, such as

shared graphical environments like those in the multi-user Internet games Everquest or Asheron's Call. There's a tremendous number of things that might happen at the college level that could be very intriguing for students, as we start to understand the kinds of design issues that emerge when you're creating these learning environments based on these three complementary types of interfaces.

S: Expanding on that idea of ubiquitous computing—of course, that's tied in with miniaturization and distributed personal computing—does this have a particular significance for learning, beyond educational administration?
CD: Having information technology distributed throughout the real world allows something that in cognitive science is known as distributed cognition. What that means is that an object has a certain kind of intelligence or the context has a certain kind of knowledge and you can do your tasks more easily because the objects and the context understand what you want to do and they can handle a lot of the low-level parts of it. Embedded smart tags and wearable devices fall into this category. Most people don't know how many microprocessors they own.... These things are literally disappearing into the woodwork. In a future time of ubiquitous computing, smart objects that may exist for very different reasons than learning offer some very interesting opportunities in terms of learning. The overall claim that I want to make is that information technologies are becoming more complex in sophisticated ways, and over the next 10 years we're increasingly going to see all three of the interfaces I referred to coexisting in the new interactive media. The ubiquitous computing and the multi-user virtual environments both are interfaces that lend themselves much more strongly toward interactive inquiry pedagogies than the presentational pedagogies.

S: What is the potential for automating data collection about learners as they wander through and interact with their real or virtual worlds, and putting that data to use either for remediation or to present them with more assistance in line with their learning styles and habits?
CD: A very rich stream of information can be automatically collected about learning patterns just by archiving—forming sort of a cognitive audit trail of what's going on. And as we develop our sophistication about how to interpret those and what that means in terms of learning styles, it opens up a lot of profound possibilities for individualization.

S: There are going to be lots of possibilities and choices in terms of interactive media that faculty can select for any given pedagogical goal or instructional setting. What do you think about the selection process, in terms of pedagogy and also relative to face-to-face instruction?
CD: I have learned that teaching with multiple interactive media is more powerful than teaching with any single medium, including only face-to-face—I'm now referring to face-to-face as a medium, which it is. So I'm claiming that, even if you could teach face-to-face all the time, students' learning would be deeper and their engagement higher if some of the time the group deliberately didn't meet face-to-face and instead learned across distance. This claim underlies the whole concept of distributed learning.

S: So then would you recommend mixing lots of different media, in an effort to cater to different learning styles?
CD: Some of my students who are relatively silent and passive face-to-face come alive in mediated interaction. Some "find their voice" in asynchronous threaded discussions. Some of them are very active in shared virtual environments. Some of them lead the class in interaction when we move into groupware. Some feel more authentic in mediated interaction than they do in face-to-face interaction, because their physical appearance does not express their inner personality. So what that says is to use multiple media so that you can reach almost everybody.

S: With the adoption of interactive media, people talk about the "sage on the stage" becoming the "guide on the side." What do you think about that?
CD: As a teacher, I don't attempt to play the sage on the stage anymore. Peer learning, when students mentor each other, sharing ideas and collaborating together, is hard to foster when the instructor is always right in the middle of things, and in a physical setting you are always in that role. Even when you try to step off the stage, you're there. But in a virtual setting it's easier for the instructor to "fade," and over the course of the semester it's interesting to watch how the balance of interaction shifts from queries directed to me, to hypotheses directed among the students to each other, with me being brought in as a guide, or a facilitator, or an expert, or a mentor when I'm needed. That is very powerful in terms of learning.

S: How far away are we from taking real advantage of multiple media—from putting new interactive media to the best possible uses?
CD: One of the things I've been heard to say is that, within my lifetime, people who don't teach with multiple interactive media will be guilty of professional malpractice. Now I'm obviously expecting to live a long time, but I think a major shift in pedagogy could take place sooner rather than later if we take advantage of the new kinds of media that are emerging, if we start to really understand these three complementary interfaces and what they mean in terms of learning styles and individualization and equity. If we really think about learning as an affective, cognitive, and social experience that is shaped by media, including the medium of face-to-face, there are some tremendously exciting things that can happen right away to open up a bright new future.

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The Interacti

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Administrative and Course Management System Vendors Take Up the Challenge

Emerging media and highly interactive technologies raise the bar for the development efforts vendors must make to remain current in a growing eLearning environment. Possibilities for improved user interaction with both academic information and administrative data, plus expectations for more integrated systems, contribute to a blurring of the lines between administrative and course management systems. Several types of companies involved with eLearning products or infrastructure work in the eLearning space, and product categories are not as clear-cut as they once were.

The eLearning landscape is changing in response to interest in portals, Web-based or Web-enabled systems, and a gradual but general evolution in academic institutions towards life-long learning. What kinds of interactive technologies interest vendors most, and what technology directions and market influences are they considering as they plan for the future? To find out, *Syllabus* polled technology leaders at key companies.

Blackboard chairman Matthew Pittinsky says, "The biggest challenge when looking into the future is discerning between interesting technologies that are eye candy, and those that are really going to impact student outcomes." Pittinsky cites three defining technology directions that will impact his company's future development: immersion, standards, and specialization.

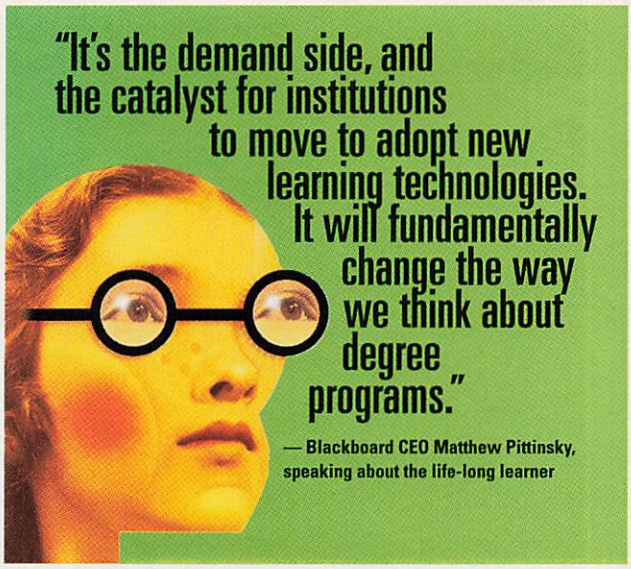
Immersion technologies will be unlike anything we now commonly use for teaching and learning. The PowerPoint presentations and streaming video of today are just the tip of the iceberg of interactive learning, Pittinsky explains. Virtual biology labs and avatars are representative of the kinds of immersion technology we can expect to use in the future, given increased bandwidth. And the online videogame industry is pioneering applications that could eventually be used to make education at a distance more socially powerful.

Standards will continue to pave the way for collaboration and sharing of content, so that institutions can discover and incorporate the best, high-end learning materials from others into their learning management systems. Standards will also influence how programs will be formed across institutions and the ways in which faculty collaborate. Learners will bring portable data with them as they move among programs and institutions. Learner profiles will contain data about their educational history and learning preferences, allowing for personalization of course materials and programs—this will put the learner in charge of the educational process.

Specialization will create discipline-based tools and peda-

gogical approaches, while institutions standardize on one course management system that will offer gradebooks, discussion boards, and other more generalized tools. Once a standard course management system has been installed, institutions will license or build a wide variety of additions that tailor a particular eLearning environment to the instructional approach that makes the most sense for the professor and the subject area. Pittinsky points to Blackboard's Building Blocks initiative, which includes open APIs and a free SDK that has been put into use by institutions such as Princeton University and Carnegie Mellon to develop extensions to Blackboard.

"Adult life-long learning is adding an entire new category of enrollments to higher education," says Pittinsky. These enrollments have different preferences, and this is causing a shift in the way institutions think about the types of programs they develop, they frequency of those programs, and the mix of live classroom instruction and online learning modes. "It's the demand side, and the catalyst for institutions to move to adopt new learning technologies. It will fundamentally change the way we think about degree programs."


"It's the demand side, and the catalyst for institutions to move to adopt new learning technologies. It will fundamentally change the way we think about degree programs."
— Blackboard CEO Matthew Pittinsky, speaking about the life-long learner

eCollege CTO Mark Resmer says the typical student served by his company is a life-long learner. "For eCollege, the life-long learner is really the life blood of the company," says Resmer. eCollege is a distance education technology provider, and most of the company's planning focuses on distance learning as the learning context, differentiated from the on-campus environment where course management systems may merely supplement classroom instruction.

Resmer points out that bandwidth is a challenge in exploiting new, highly interactive media. The industry as a whole is driven by bandwidth. Often students are still using 56Kbps modems at home, limiting the potential for interactivity until broadband becomes more ubiquitous. eCollege has recently introduced a new technique called http compression in an effort to address this 'last mile' problem. The time it takes to render pages is decreased by orders of magnitude, simply and cheaply.

The expense of creating highly interactive and pedagogically rich content is another challenge. To help facilitate production, eCollege has incorporated both synchronous and asynchronous learning into the courses. Creating synchronous events is less complex than structuring asynchronous ones, but students have a strong desire for asynchronous learning. The ability to capture certain kinds of synchronous events and then use them in an asynchronous context will go a long way towards solving this problem. eCollege also has a large, active course development and instructional design unit as a resource for faculty. Over time, faculty may realize the true potential of the technology and take on more of the development themselves.

Another area of interest is the new media capabilities of commodity PCs, along with Web services technologies. With the advent of Windows Media built into the operating system, and the possibility of leveraging new tools on the desktop in the learning offerings, courses can be less dependent on what is delivered purely over the Web. Hybrids can be created that are accessed over the Web but take advantage of locally hosted client applications. Web services technologies will create flexible deployment for those kinds of applications and will open the door for collaboration, customization, and ultimately, personalization.

One interactive technology application that eCollege finds intriguing, says Resmer, is in the area of online labs. Virtual labs go beyond simulation—they allow the student to do real work. The lab is integrated into the student's learning environment, providing virtual access to a physical resource.

eCollege also stresses Section 508 compliance, so that learning experiences are designed to be accessible to users who may have a wide range of disabilities. "eCollege is fully 508 compliant," says Resmer. "The challenge is to maintain that compliance as content becomes richer and more interactive."

WebCT CTO Chris Vento explains that enterprise academic software infrastructure is key to his company's strategy. "It's important to build an enterprise academic application infrastructure as a flexible platform, not only so that we can provide the technologies that WebCT builds, but more importantly, to leverage the variety of technologies that are already available, or that will become available externally." WebCT will offer a platform that will provide this type of integration, whether the technologies are built by WebCT or available from outside sources. The platform will take advantage of Web services and XML messaging to allow different systems—such as WebCT and other learning platforms, communications systems, media servers, and VoIP servers—to interoperate much more easily. For example, on the administrative side, XML-based messaging will allow interoperability with calendaring, collaboration, content management, and mail systems. WebCT is just beginning to provide interoperability via XML messaging or Web services. "It's a great way for systems to interoperate without having to have perfectly aligned architectures—something that is never going to happen," adds Vento.

WebCT will focus on technologies that map to learning in useful and functional ways, says Vento. Interactive messaging, instant messaging, and peer-to-peer communications technologies will extend the reach of the learning experience. There is also

continued on page 42

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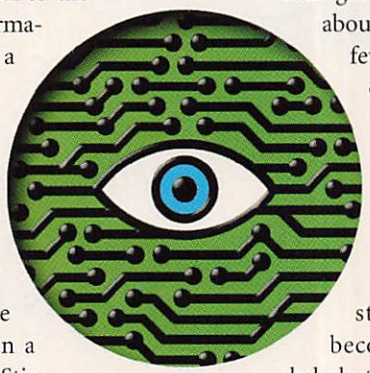
Sally M. Johnstone

As founding director of the Western Cooperative for Educational Telecommunications at the Western Interstate Commission for Higher Education, Sally M. Johnstone serves as a resource on higher education technology issues. She also serves on the board of the American Association for Higher Education, the U.S. Open University's Board of Governors, and the Advisory Panel for the Consortium for the Advancement of Private Higher Education.
sjohnstone@wiche.edu

Class Participation and the Whites of Their Eyes

When students and faculty work together at a distance electronically there are some things that can happen that are practically impossible in a face-to-face classroom setting. Granted, there are things that can happen in a classroom that cannot happen electronically, such as full sensory exchanges, visual, aural, olfactory, etc. Some of those may be important, but I find it hard to understand arguments that they are critical to the teaching of new skills and information or to the assessment of a student's mastery of a subject.



A lot of work has been done over time on what is important to the learning process. One element that has been identified consistently is how engaged a student is with the material he or she is trying to master. In a recent forum I attended, John Stinson from Ohio University described a way he is assessing the engagement of his online students. John uses threaded discussion in his online classes. He requires students to participate in these discussions and evaluates their participation.

John has a written record of all his students' comments. He evaluates those comments on four levels. First he looks for the student's immediate personal reaction. Then he also checks for reports of some type of research (including informal discussions with experts). He says he always expects his students to comment at these first levels, but he also pushes them for even more engagement. John checks for evidence of synthesis and generalization of the material within the comments. His last level is my favorite. It is both practical to administer and seems valid. At the end of the term, John looks at the responses from other students that each student's comments generate. If the original comment was not very thought provoking, other students are not likely to react to it. He can actually count the number of responses. That is pretty hard to do in a classroom discussion unless the instructor uses outside observers.

A couple of weeks ago, I had dinner with two experienced members of the faculties of institutions on opposite sides of the country. Both these learned gentlemen still teach mostly in the classroom. It has been a while since I have taught undergraduates and what they told me about their experiences of the past few years was disturbing. They each told me similar stories regarding the lack of respect many of their students seem to have for them. They related tales of disruptive behavior and constant challenges to their assessments of students' work, some even becoming litigious. I could not help but think of John and his online-enabled assessment scheme. My dinner companions could not have the physical evidence to show their students the quality of their classroom discussions. There may be forces greater than convenience that are driving higher education into more use of online classes.

These two professors do use online resources in their classes, but their direct work with their students is primarily face-to-face. While they both admitted that a growing number of students were tough to handle, they also relayed the joys of working closely with enthusiastic, engaged students. They shared with me the joy they feel seeing a student's face change, as he or she finally understands some complex idea. This part of the conversation made me think nostalgically about the classes I used to teach. Then I remembered those early morning classes in summer, after most of my students had been "partying" late into the night. There are some sensory elements to those encounters that I could easily have done without.

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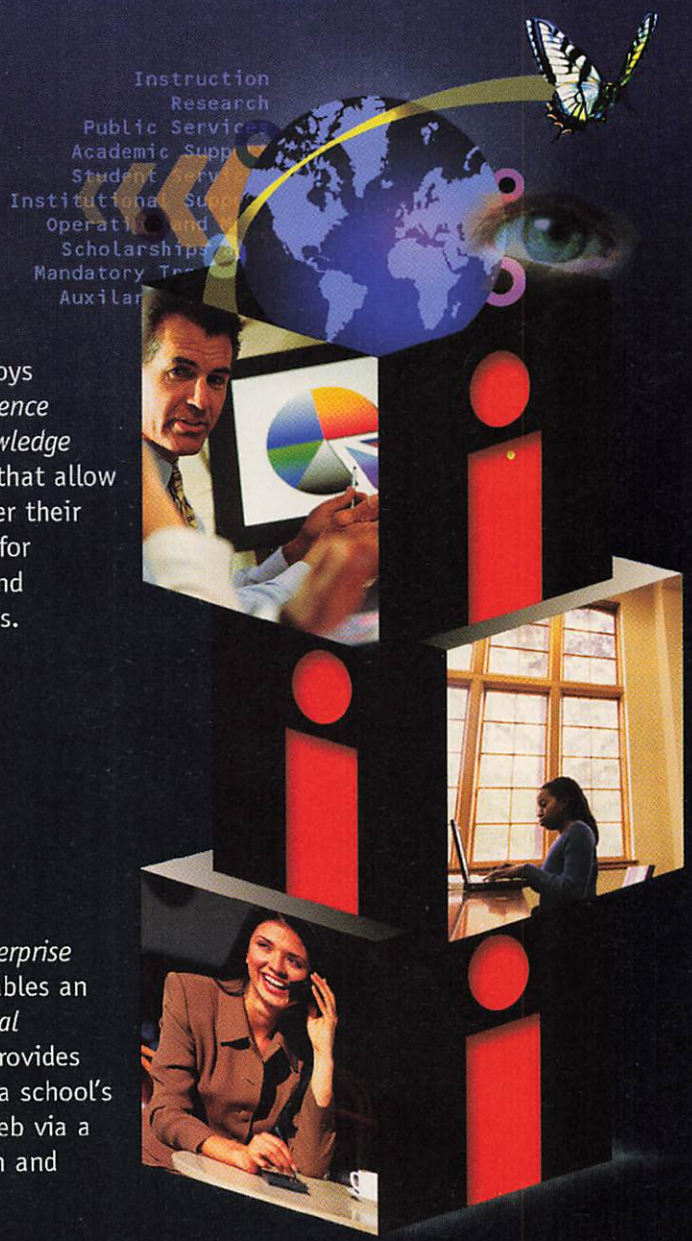

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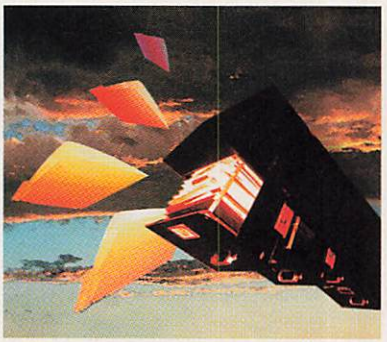
David G. Brown

David G. Brown is vice president and dean of the International Center for Computer Enhanced Learning. He has served as president of Transylvania University, chancellor of the University of North Carolina at Asheville, and chair of several national groups, including the American Association for Higher Education and the Higher Education Colloquium. As provost of Wake Forest University, he founded the Annual Conference of Ubiquitous Computing Colleges and Universities, and founded the Journal of Computer-Enhanced Learning.
brown@wfu.edu

File Cabinets in the Sky

I'm a big advocate for course management software. It magically converts ordinary text, tables, and pictures into Web pages. The password-protected Web pages are then automatically viewable by all class participants. Students may, like the professor, post materials to the course Web site. No special knowledge is necessary.

It's as if there were a program that automatically provided a perfect translation from English to Chinese (or French to Russian), except in this instance it's a perfect translation from language that can't be read on the Internet to language that can be read. Novice instructors can, with less than an hour of training, make all course materials Internet accessible.



The best-known course management software systems are Blackboard and WebCT. On his Web site, Bruce Landon provides comparative reviews of 56 such systems (www.c2t2.ca/landonline/evalapps.asp). As you will see, people have had a lot of fun thinking up names for these systems, such as Generation 21, Top Class, ANGEL, Eloquent, Learning Space, Prometheus, Docent, eCollege, Class Act!, and the Learning Manager.

But most systems are functionally similar. Think of them as file cabinets in the sky, with a cabinet for each course. Materials are placed in a specific drawer. In each drawer there are folders (sometimes there are folders within folders).

Most of the systems have five or six drawers. Some drawers will accept only documents from the instructor but will allow all to view them. Another drawer might allow everyone in the class to add, view, revise, or even discard anything in it. There is usually a drawer for grades, where only the instructor can make entries and each student can view only his or her folder.

By creative selection of drawers, the professor implements an education philosophy. One drawer allows collaborative development of papers. Another allows all students to view grading comments on one another's papers. Still another drawer keeps secure the original text of the professor's lecture. Fully private drawers are available to the instructor and in most systems for the students, for materials they are not yet ready to share with the professor.

Interaction among students can occur asynchronously (comments are submitted at different times) via discussion groups. Here streams of comments, reactions, and replies may be devoted to a single topic. If circumstances call instead for simultaneous (synchronous) discussions, most course management software provides a space for online chat in the same real time.

These course management systems are frankly too useful to be limited to courses. Each academic department can deposit materials, hold discussions, and conduct chat sessions on topics of common interest. Each student organization—the band, the debate team, social fraternities, disciplinary honoraries—can use its own file cabinet in the sky. Alumni interest groups, governing boards, research collaborators, association officers, and innumerable other affinity groups can productively increase community and collaboration by using these systems.

Kenneth Greene reports, in his most recent *Campus Computing Survey,* that roughly one-fifth of all college courses in the United States are using course management software. It's likely that well over half of the technology-intensive courses are using the software. I strongly urge every professor and teacher to consider using a course management system. It is hard for me to imagine teaching without one!

Illustrated by Susan Morrison

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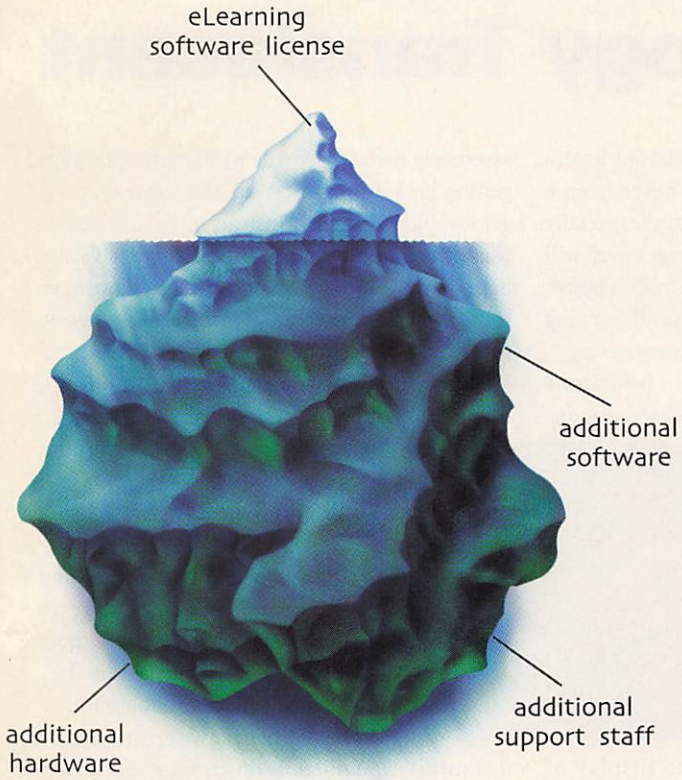

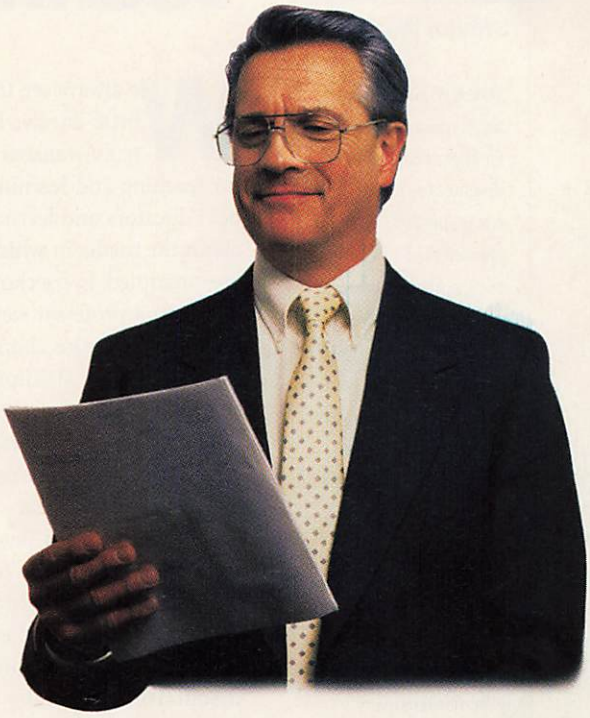

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Steven W. Gilbert joined the American Association for Higher Education as director of technology projects in July 1993. He founded the TLT Group as the Teaching, Learning, and Technology Affiliate of AAHE in January 1998. He was previously vice president of EDUCOM, where he created and led the Educational Uses of Information Technology program and the EDUCOM Software Initiative. He also moderates the Internet Listserv TLT-SWG.
gilbert@tltgroup.org

Making Education Technology Translucent

We always see through a glass at least a little darkly. There has never been a truly transparent medium, especially for teaching and learning. And there never will be. Educators and learners always make choices about the media in which teaching and learning are attempted. Every choice has consequences.

When a professor steps out from behind the lectern, he or she changes whatever happens next. When a student approaches a faculty member with a question just before or after a class, he or she changes whatever happens next.

The TLT Group has been offering a weekly series of Web casts this year in which we simultaneously offer the audience audio presentations or discussions, centrally controlled display of PowerPoint slides and Web pages, and real-time brief surveys. There is also a chat room or live discussion board built into the interface so that all members of the audience can hear the conversation, see the slides, and see the chat room simultaneously.

When we first used this combination, I found the chat room irritating and distracting. I couldn't comfortably note the relevant questions and comments in the chat room and pay enough attention at the same time to the oral comments of my guests to guide the interaction effectively.

Fortunately, in another series of Web casts, Trent Batson of the University of Rhode Island initiated the practice of assigning a "presenter" to focus primarily on the chat room, and voice selected themes, comments, or questions from that discourse. This served to encourage the audience to participate more actively in the chat room, because they knew someone would be linking their efforts to the leaders of the event.

More recently, we took two other steps that have changed the character of the sessions. We begin every Web cast by explaining carefully and assertively that we provide a different option for getting help during the Web cast—one that will get a rapid response—instead of having people use the chat room for this purpose. We have also begun inviting one or two people who have some expertise in the topic of the Web cast to participate entirely as "chat room discussants." We ask them to participate in the chat room as if they were members of the audience and to set an example of model chat room behavior.

Our Web casts now function effectively in three ways—via audio, text, and slides—and participants can choose to follow or actively participate using any combination they find comfortable and useful.

We believe we are now using this media combination much more effectively because we are attentive to its characteristics. We also believe we have enabled our audience members to participate much more effectively and with greater satisfaction because we offer guidance and examples of how to do so.

The alternative is perilous. By ignoring the implications of any medium, you may be subject to unintended consequences and its abuse. By striving to make it invisible or transparent, you are likely to be punished if you fall short of perfection.

Many of the new media options offer ways of personalizing communication between students and faculty, enabling all involved to connect more fully as human beings, not just as those who deliver and receive sterile information. This is most often achieved by increasing awareness of each medium's characteristics, rather than letting it disappear. Of course, the goal is to achieve some balance between ignoring the medium and spending too much time and energy on decisions about it. In education, technology should be neither transparent nor opaque. It should be translucent.

Illustrated by Dominique Sarraute

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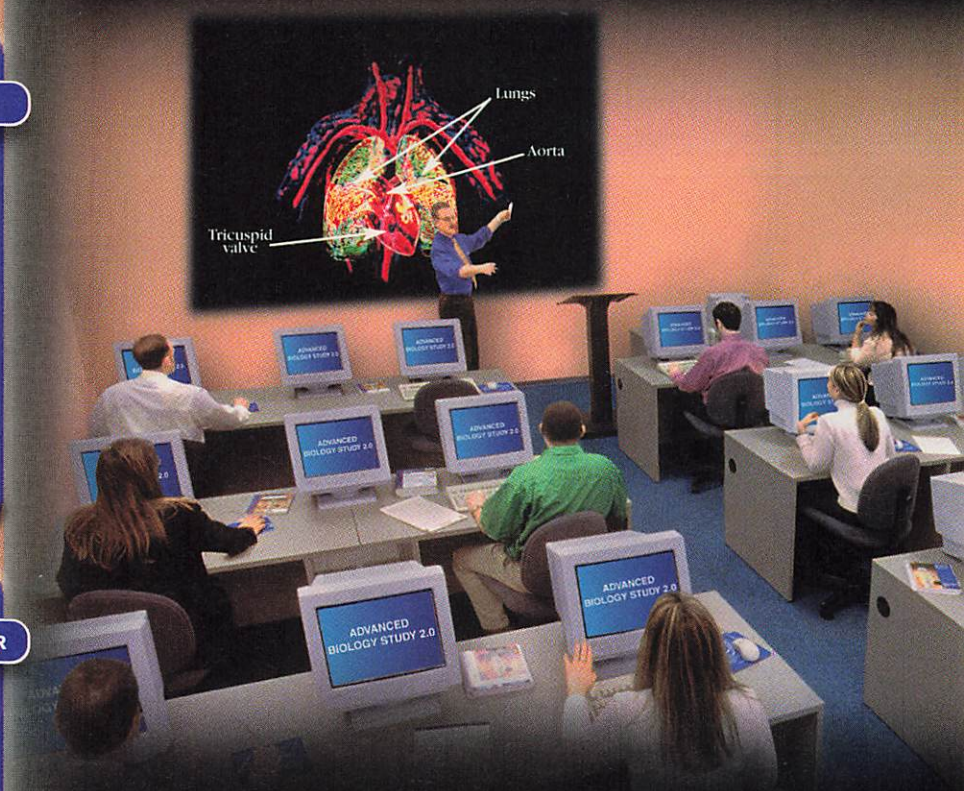

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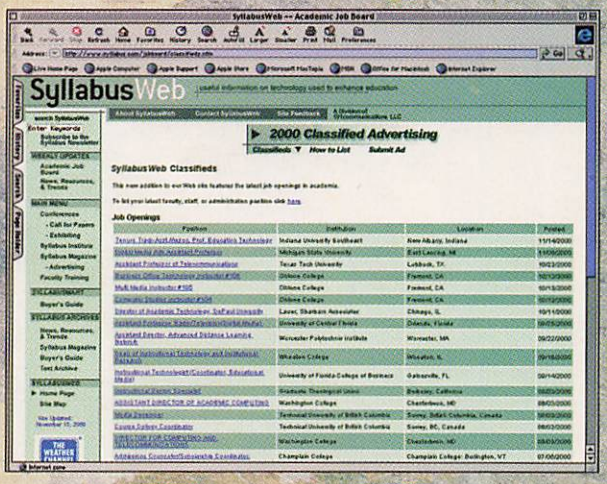

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Syllabus 2002

TECHNOLOGY FOR HIGHER EDUCATION

THE NINTH ANNUAL SYLLABUS

Education Technology

Conference and Exhibition

July 27-31

Santa Clara Convention Center
Santa Clara, California

- **Track 1:** *New Technologies Update*
- **Track 2:** *Infrastructure and IT Planning*
- **Track 3:** *Open Source/New Publishing Models*
- **Track 4:** *Web-Based Environments*
- **Track 5:** *Evaluation and Assessment*
- **Track 6:** *Faculty Innovation: Case Studies*

conferenceupdatesection

Syllabus2002 update

Featured Sessions

Along with the topics reflected in the six conference tracks, the Syllabus conference program board has identified six additional topics of current interest, and each board member will moderate an invited session, as follows:

Judith V. Boettcher, Ph.D., CREN (chairperson)

Monday, July 29 1:30PM-2:30PM

Invited Session: *Innovative Ideas and Lessons Learned from the Pew Grant Program in Course Redesign*

Invited speaker: Carolyn G. Jarmon, Ph.D., Associate Director of the Center for Academic Transformation at Rensselaer Polytechnic Institute

The Pew Grant Program in Course Redesign is a $6 million grant program that supports the efforts of colleges and universities to redesign their instructional approaches using technology in order to achieve cost savings as well as quality enhancements. This session will provide an overview of the program and the insights that have been gained from it.

Lois Brooks, Stanford University

Tuesday, July 30 4:30PM-5:30PM

Panel: *Connecting Everyone—Accessibility in Action*

At the intersection of pedagogy and emerging technology lies an area of innovation that is critically important, assistive technology, which offers exciting possibilities for learners with disabilities or differences. Join a panel of students who use assistive technology, along with experts in the field who will describe the new ideas, products, and programs that are effective on college campuses today.

Kathy Christoph, University of Wisconsin-Madison

Monday, July 29 4:15PM-5:15PM

Panel: *Course Management Systems—Now and Tomorrow*

The question, "If you could have anything, or make anything you wanted happen, what would that be?" will launch a discussion of possibilities and priorities for course management systems. Invited panelists will include experts who have knowledge of the current and future initiatives of commercial course management systems vendors, along with a representative from an Open Knowledge Initiative (OKI) institution. The goal of the discussion is to focus on the state of the software and the larger implementation issues for current and future versions, with an emphasis on the newer releases.

Phillip D. Long, Ph.D., MIT

Monday, July 29 3:00PM-4:00PM

Panel: *"Making Standards" for Learning Systems?*

A common misperception of the software development community is that specifications and standards are developed and approved in a measured and sequential process. Nothing could be further from the truth. Achieving consensus in software specifications is part leadership, part timing, part advocacy, and part serendipity, with perhaps a touch of intellectual insight. Developing and publishing specifications may seem to be a cloistered process with participation by an anointed few. In fact, it is largely open and public, but like participative democracy, you have to be engaged to have your voice heard. A select panel involved with learning system specifications will share their insights, frustrations, and views on this

Agenda At-A-Glance

Sat. and Sun., July 27-28

(Pre-Conference Workshops and Seminars)

8:30AM-3:30PM
- Full-day workshops and seminars

8:30AM-12:30PM
- Half-day workshops and seminars

8:30AM-3:30PM
- TLT Group Summer Conference

Mon., July 29

8:30AM-10:00AM
- Keynote - Diana Laurillard

10:00AM-11:00AM
- Refreshment break in the exhibit area *(Exhibit hall open 10:00AM-3:00PM)*

11:00AM-12:00PM
- Breakout sessions

12:00PM-1:30PM
- Lunch in the exhibit area

12:30PM-1:30PM
- Poster sessions
- Technology classrooms

1:30PM-2:30PM
- Breakout sessions

2:30PM-3:00PM
- Refreshment break in the exhibit area

3:00PM-4:00PM
- Breakout sessions
- Technology classrooms

4:15PM-5:15PM
- Breakout sessions
- Technology classrooms

5:15PM-7:00PM
- Opening reception in the exhibit area *(Exhibit hall open 5:15PM-7:00PM)*

Tue., July 30

8:30AM-10:00AM
- Keynote - Lawrence Lessig

10:00AM-11:00AM
- Refreshment break in the exhibit area
- Technology classrooms *(Exhibit hall open 10:00AM-3:15PM)*

11:00AM-12:00PM
- Breakout sessions

12:00PM-1:30PM
- Lunch in the exhibit area

12:30PM-1:30PM
- Poster sessions
- Technology classrooms

1:30PM-2:30PM
- Breakout sessions

2:30PM-3:15PM
- Refreshment break in the exhibit area & prize drawing

3:15PM-4:15PM
- Breakout sessions
- Technology classrooms

4:30PM-5:30PM
- Breakout sessions
- Technology classrooms

Wed., July 31

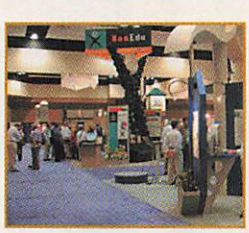
8:30AM-10:00AM
- Keynote - Jack Wilson

10:00AM-10:30AM
- Refreshment break

10:30AM-11:30AM
- Breakout sessions

11:30AM-1:00PM
- Luncheon

1:00PM-2:00PM
- Breakout sessions



peculiar process. Among the panelists will be Ed Walker, CEO of IMS Global Learning Consortium.

William H. Riffee, Ph.D., University of Florida

Tuesday, July 30 3:15PM-4:15PM

Panel: *Major Technology Initiatives at Research Universities*

How are Research 1 universities and AAU comprehensives engaging technology to meet the challenges of the next decade? While there is no cookie-cutter approach to success, a discussion of best practices will give guidance to individual attendees, which could help spark a revolution at their institutions. Invited speakers include: Jack McCredie, Ph.D., Associate Vice Chancellor, Information Systems and Chief Information Officer for the University of California, Berkeley; Tom Lewis, Director, Educational Technology Development Group, Office of Educational Partnerships and Learning Technologies at the University of Washington; and Mary Doyle, Ph.D., Interim Vice President for Information Technology at Washington State University.

Frank Tansey, IMS

Tuesday, July 30 1:30PM-2:30PM

Panel: *Technology and Pedagogy—Past, Present, and Future*

There are many faculty now teaching with technology, and many have done so for some time. But just a few were the early adopters, who not only pioneered teaching with technology, but also trained, shared their knowledge, and remained in the front lines of instructional technology use. Their unique perspective is invaluable in describing the best pedagogical practices and planning for future instructional technology. Two of the Syllabus Scholars, widely recognized for their contributions to education technology, will be the featured panelists in this unique session: Robert Cavalier, Ph.D., Professor of Philosophy, Carnegie Mellon University, and Alistair B. Fraser, Ph.D., Emeritus Professor of Meteorology, Penn State University.

Keynote Speakers

Monday, July 29

Diana Laurillard, Ph.D.

Pro-Vice Chancellor for Learning Technologies and Teaching

OPEN UNIVERSITY OF THE UK

Keynote - 8:30AM-10:00AM

"Form versus Function in Pedagogic Design—Creating the Community of Practice"

Extended Discussion Session - 11:00AM-12:00PM

Educators who use learning technologies can engender a community of professional practice—by building on each others' work, sharing good practice, and creating a library of re-usable materials. Diana Laurillard's work has focused on the idea of a conversational framework, which is used to define the learning process for higher education, and then to interpret the extent to which new technology can support and enhance higher-level conceptual learning. She has spent 25 years in research, development, and evaluation of interactive multimedia materials and Internet services for education and training, covering a wide range of discipline areas.

Tuesday, July 30

Lawrence Lessig

Professor of Law and Founder, Stanford Center for Internet and Society

STANFORD UNIVERSITY

Keynote - 8:30AM-10:00AM

"To Promote the Progress of Science: Law's Regulation of the Creative Process"

Extended Discussion Session - 11:00AM-12:00PM

Lawrence Lessig will explore how law will regulate the creative process as digital technology increasingly becomes part of ordinary life. The expanding scope of legal regulation—especially through copyright and patent—threatens to undermine the important role technology might have for education and knowledge. Lessig is recognized as the most prominent legal thinker on the intersection of the law and the Internet, and has done extensive writing and speaking on intellectual property rights, free speech, and creativity in cyberspace.

Wednesday, July 31

Jack M. Wilson, Ph.D.

CEO and Founder, UMassOnline

UNIVERSITY OF MASSACHUSETTS

Keynote - 8:30AM-10:00AM

"eLearning: After All the Hype, Is It Over?"

Extended Discussion Session - 10:30AM-11:30AM

eLearning was the most exciting issue in the past few years as campus after campus launched eLearning initiatives and virtual universities. Some still thrive while others struggle to find a role or shut down entirely. What's the difference between success and failure and what's next for eLearning? Jack Wilson is a national leader in distance learning and an innovator in higher education. As CEO and founder of UMassOnline, the University of Massachusetts' Virtual University, and 33 years in higher education, he brings a unique perspective to discussions of online learning.

Syllabus2002 Silver Sponsor: MetaText™ Digital Textbooks

Integrating Digital Imaging Technology in the Undergraduate Biology Curriculum

Students have long prepared free-hand drawings of objects viewed through a microscope. Microscope-mounted 35mm cameras offered a possibility to document images with clarity, but high costs in equipment, processing, and time make 35mm cameras somewhat impractical. Now, the digital camera is changing the picture in the undergraduate biology laboratory.

By Chris Sacchi, Anne Zayaitz, Wendy Ryan, William Towne, and Carol Mapes

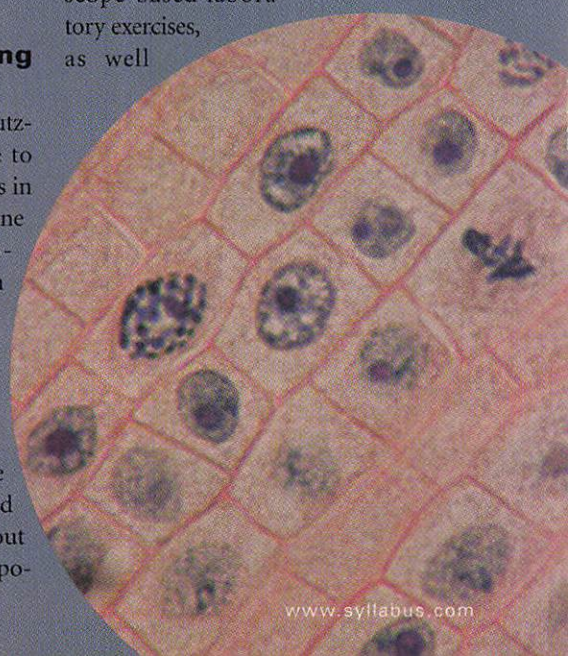
KUTZTOWN UNIVERSITY

Digital cameras that produce images of excellent quality can provide instructors with the ability to introduce photography, at low or no per-image cost, into the undergraduate biology laboratory. And images produced by digital cameras can be downloaded to computers, where information about the organisms or structures under study can be analyzed more extensively using image analysis software designed for that purpose.

A Need for Digital Imaging Technology

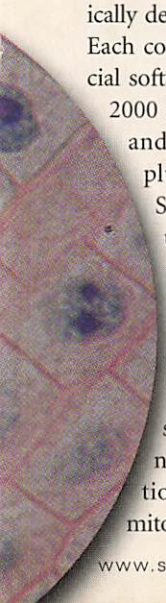
In evaluating the biology courses at Kutztown University that students take to fulfill the requirements for B.S. degrees in Biology, Environmental Science, Marine Science, or Secondary Education-Biology, we found that a common concern was the need for students to acquire accurate information about visual materials and to extract course-appropriate information about those materials. Informally, students had expressed an interest in having more effective tools than hand-rendered drawings to aid them in learning about biology. The introduction of contemporary technological tools appeared to us to be the best means for students to accomplish the goal of recording and analyzing accurate images of visual materials.

We felt that it would be appropriate to introduce students to the use of digital imaging technology from their first course in biology, the introductory Principles of Biology course, through the core program, including Introduction to Botany and Introduction to Zoology. Targeted upper-division subjects included Genetics, Microbiology, Plant Physiology, Marine Science, and others. In all, we envisioned adapting eighteen microscope-based laboratory exercises, as well



as independent study projects in thirteen courses. We planned for students to utilize the same technology in a variety of courses and to learn diverse applications for using digital image capture and analysis. In exploring how instructors at other colleges and universities were using digital imaging technology, we found that it was primarily used in upper-division courses, e.g., cell biology or histology. We believe that our expansion of digital imaging technology to the entire biology curriculum, our Biology Lab Adaptation and Digital Imaging Technology Project, represented a departure from these earlier uses.

We have acquired a sufficient number of digital imaging workstations so that students, working in groups of up to three, can have hands-on access. A digital imaging workstation consists of a research-quality Nikon microscope equipped with a trinocular head adapted for use with a Nikon CoolPix990 digital camera, and a Pentium computer running MS Windows that is connected to a color inkjet printer. The CoolPix990 camera is a consumer camera that can be readily adapted for use in the biology laboratory. For the undergraduate classroom, this camera and adapters were much more economical to acquire than digital cameras specifically designed for use with microscopes. Each computer is loaded with commercial software, including Microsoft Office 2000 Professional, Adobe Photoshop, and the Image Processing Toolkit, plus free image analysis software, Scion Image, which is adapted for use with PCs.



Labs Adapted

Lab exercises were adapted to enhance student learning in biology. From both faculty and student perspectives, digital technology has improved the traditional study of the cell cycle and mitosis in plant and animal cells.

In the past, students would examine cross-section slides of onion root tips and white fish blastula to study the process of mitosis in a representative plant and animal. Students would sketch the stages of mitosis and, in the onion root tip, might have counted the number of cells in each stage of the cell cycle. When numbers were inconsistent with expectations, it was often difficult to determine why the counts were in error, e.g., did a student have difficulty in correctly identifying the stages of the cell cycle?

Goals of the Biology Lab Adaptation and Digital Imaging Technology Project

1. An important computer-assisted technology will be used by the students in the preparation and analysis of digital images of microscopic and macroscopic biological materials.
2. Introduce students to the importance of collection, analysis, and presentation of quantitative data.
3. Students will utilize computer software to prepare labeled images of biological materials to develop a more complete understanding of biological phenomena.
4. Students will develop the necessary skills and will have the technological resources available to prepare clear and thorough presentations of the results of laboratory observations and experiments through written reports, poster presentations, and oral presentations.

With a digital imaging workstation, students capture images containing each stage of the cell cycle. They can upload the image to the computer, open it in Adobe Photoshop, crop the image to highlight a specific cell cycle stage, and then import the image into a MS Word document, where they can make a labeled diagram of the cell cycle-they do this for both plant and animal cells. For the portion of the exercise where the students count the number of plant cells in each cell cycle stage, they can record several images of the onion root tip using the camera. After downloading to the computer, students label each life cycle stage on a given image so that there can be agreement between student and instructor about the identity of these cell cycle stages. Further, when students are examining their images on the computer screen, they can share information and observations with their fellow students; the on-screen image is an invaluable teaching tool through which the students and the instructor can clarify their interpretations of which cell structures and life cycle stages are evident in the images.

Assessment and Outcomes

Periodically, software has locked up, necessitating the shutdown and restarting of computers. Continued efforts to deal promptly with technical problems by both faculty members and the Information Technology department are important to the successful introduction of technology into the undergraduate classroom.

Overall, the use of digital imaging technology in conjunction with standard software and image-processing software has led us to conclude that instruction in the biology laboratory is enhanced by this technology. While we have not evaluated whether students learn each subject more effectively now than prior to their use of the technology, we do have evidence from assessments that student attitudes about learning with digital imaging technology are very positive.

Chris Sacchi, Ph.D., (sacchi@kutztown.edu) is an assistant professor; Anne Zayaitz, Ph.D., is an associate professor; Wendy Ryan, Ph.D., is a professor; William Towne, Ph.D., is a professor; and Carol Mapes, Ph.D., is an associate professor, all in the Department of Biology at Kutztown University.

ACKNOWLEDGMENTS

Support for curriculum revision for this project was provided by the National Science Foundation's Division of Undergraduate Education through the Course, Curriculum, and Laboratory Improvement program (Grant DUE-9952337) and Kutztown University.

A DIGITAL LABORATORY MANUAL

FOR UNDERGRADUATE BIOLOGY

BY STEPHEN GALLIK, MARY WASHINGTON COLLEGE

Traditionally, biology instructors have depended on conventional laboratory manuals or handouts for dissemination of the protocols, background information, diagrams, and photographs required to guide students through bench-top exercises in the teaching laboratory. More and more, however, instructors are using the Web as an alternative or supplemental source of instructions and resources for the teaching lab.

Within the confines of the typical undergraduate natural sciences teaching laboratory, computers are most often used as components of analytical equipment that control the equipment and collect data. As extensions of the teaching laboratory, computers are also often used by students away from the lab bench as personal tools to analyze data and prepare laboratory reports. And more and more, computers are being used to access online information that can be used to supplement the laboratory manual. Too often, however, the various pieces of software or sources of online information used in these situations are operationally disconnected from the actual principal laboratory manual that is used to guide students' basic laboratory work.

The Digital Laboratory Manual

During the past several years, I have worked on the development and implementation of a complete, fully interactive educational tool called a digital laboratory manual (DLM). A DLM is an online, interactive textbook designed to incorporate all aspects of a specific set of laboratory exercises into one resource to be used at the lab bench. A DLM not only guides students through experiments in the laboratory, but also offers a complete package of all the informational and analytical tools necessary to complete experiments at the lab bench.

Most of my work in this area has focused on the development of a DLM for histology (a study of animal tissue structure), a course that is required for first-year medical students, first-year veterinary medical students, and first-year dentistry students, and is frequently offered as an upper-level course in undergraduate biology programs. The DLM I have produced has gone through three generations of development.

The first generation was a standard client-based Windows7 application distributed via CD-ROM. The second was a Windows7 application that contained a customized browser, built from Microsoft Corp.'s WebBrowser Technology and hard-coded exclusively to access the highly scripted pages of the manual over the Internet. The third, and current, generation of the DLM is a public online resource designed to work best with Microsoft's Internet Explorer Version 5.0 or higher.

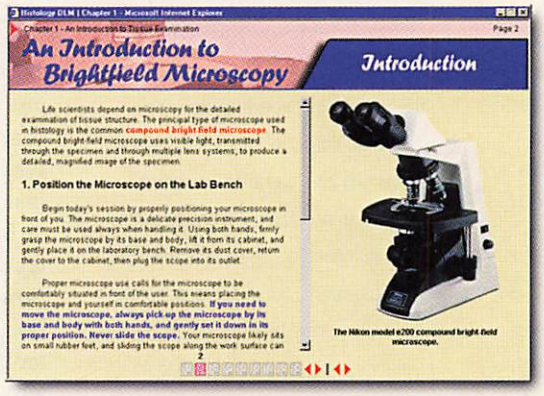
More than Simulation

The purpose of this manual is not to serve as a simulation; the intent is not to replace the microscope, but to have the

DLM serve as a genuine laboratory manual to guide students through the microscopic study of tissues. The development of the manual is based on the premise that histology not only involves identification, but also requires the ability to examine a specimen under the microscope, understand the quality of the specimen, and know how to navigate about the specimen in order to evaluate it.

The DLM consists of fifteen chapters that guide the student through the microscopic study of all major tissues and organs of the mammalian body. It includes a library of more than 200 different tissue images, all original to the manual. Although many fine digital teaching tools for histology have been developed, and several offer online histology references, I believe this DLM to be the first of its kind.

The manual has four features that, when combined, make it unique. First, each chapter contains a comprehensive text that systematically guides students through the microscopic study of mammalian and human tissues. Second, fully labeled images, taken at the four magnifications commonly available on student microscopes, accompany the text. Third, each chapter contains background information that introduces each organ. And finally, all of this is brought to the student online.


An Introduction to Brightfield Microscopy
Introduction
1. Position the Microscope on the Lab Bench
The Nikon model e200 compound bright-field microscope.

The first chapter of the manual introduces the basics of brightfield microscopy and proper microscope use.

On the left side of the page, scrollable text provides detailed instructions for the study of a slide at each magnification. On the right side of the page, corresponding, fully labeled images of each specimen, taken at each magnification, are presented, along with a set of digital buttons that enable the user to switch from one magnification to another.

Implementation Considerations

I have used the DLM as the sole laboratory manual in my histology course at Mary Washington College over the past two years. Implementation presented two obvious considerations. First, each student station in the undergraduate laboratory needed to be wired for Internet connectivity. Fortunately, the new Jepson Science Center at Mary Washington College is wired in this way. Second, each student needs a computer. Because students are not required to bring laptop computers to campus, it was necessary that the lab be equipped with a computer for each student. Because of this second requirement, a single lab section of the course was limited to 12 students.

The DLM was delivered via the campus high-speed intranet. Therefore, use of the manual in class did not depend on general Web traffic or on the functioning of Internet routers. The pages of the manual were dependably present on demand. However, use of the manual off-campus was another issue. The DLM was designed for use in an academic setting with its typical high-speed Internet connection. Although the manual can be used in any setting connected to the Internet, its high-content pages will likely take a very long time to load via standard lower-speed residential connections. We have estimated that download time with a typical residential dial-up modem would range between 30 seconds to 5 minutes, depending on the page.

DLM Effectiveness

As a teaching tool, the DLM seemed to do its job well. We found that students were able to cover and comprehend the material more efficiently using the manual than in the previous years without the DLM. In fact, they were able to cover and comprehend what was traditionally an entire laboratory session in about half the time. This being the case, instructors using the manual should be able to incorporate more activities into a routine lab period, getting more out of the session. A formal survey of the students from courses in 2000, 2001, and 2002 backs up these findings. And all students surveyed agreed or strongly agreed that similar manuals for other biology courses, such as anatomy, zoology, and botany, would be valuable.

Stephen Gallik, Ph.D., (sgallik@mwc.edu) *is an associate professor of biology at Mary Washington College.* Histology: The Digital Laboratory Manual *is available for use online at www.gallik.mwc.edu.*

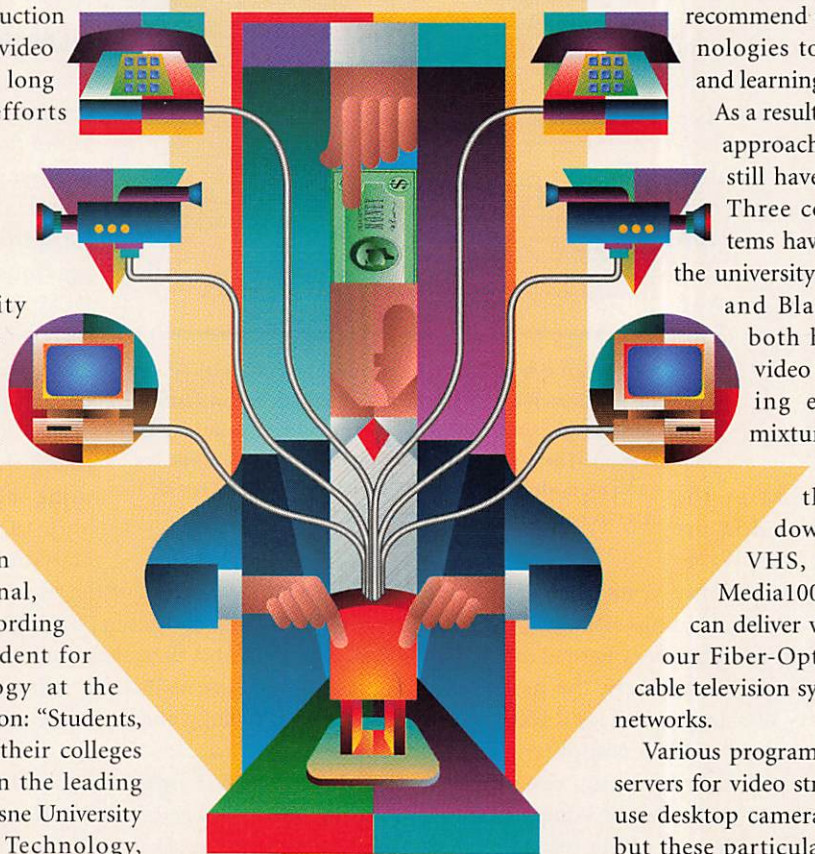
Planning and Implementing Instructional Video

By Allen Burnett, Don Maue, and Edward McKaveney
DUQUESNE UNIVERSITY

Since its first experiments with instructional video in 1995, Duquesne University has gained significant experience in producing and delivering video for multimedia, video conferencing, and Web-based courses. Here, three campus technology leaders examine the evolution of instructional video at Duquesne and explain how a collaborative planning process is shaping its future.

As faculty, students, and presenters begin to use new video capabilities at Duquesne University, they are collaborating to make instructional video successful and planning the technology infrastructure to support it. The university is enhancing equipment installations and augmenting services to support video streaming, multicasting, and Internet-based conferencing.

Most elements of a collaborative strategic plan developed in 2001 have now been completed, including: sharing results of faculty members using video, developing university standards, providing consulting and training to faculty members, optimizing video services for campus network topology, and establishing a stable production process. But instructional video at Duquesne has come a long way since the initial efforts began in 1995.



The Early Stages: Evolved Rather than Planned

Each year, the university delivers a growing number of courses via video conferencing, the Internet and the Web, or a combination of technologies. These technologies are also playing a greater role in supplementing traditional, face-to-face courses. According to Ira Fuchs, vice president for research and technology at the Andrew Mellon Foundation: "Students, faculty, and staff expect their colleges and universities to be on the leading edge of video use." Duquesne University is no exception. Music Technology, Multimedia Technology, Nursing, Instructional Technology, Studio Arts, Communication, Education, Business, Health Care Ethics, student radio and TV stations, and Distance Learning are just a few of the programs at Duquesne that have either used or expressed serious interest in multimedia projects that incorporate video.

Early experiences with new video technologies on campus were evolutionary—that is, as new technologies became available, we offered them and looked for faculty willing to experiment and apply these technologies to their content areas. There was no overall plan to target specific areas for development, though we did have a university-level Educational Technology Committee to recommend the use of new technologies to improve teaching and learning.

As a result of this evolutionary approach, we have had, and still have, a mix of systems. Three course delivery systems have been supported at the university: FirstClass, WebCT, and Blackboard. We have both high- and low-end video recording and editing equipment, and a mixture of platforms and media, including the Mac OS, Windows, TARGA, Dazzle, VHS, S-VHS, MiniDV, Media100, and FireWire. We can deliver video on campus via our Fiber-Optic Video Network, cable television system, and local-area networks.

Various programs operate their own servers for video streaming, and faculty use desktop cameras for conferencing, but these particular implementations

Illustrated by August Stein

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are not sufficiently prepared to scale in size or to provide high levels of quality. Video may be delivered from a variety of points on campus, but there is no planning for the uneven impact on portions of the network.

Adopting and Adding New Technologies

We began our evolutionary process in 1995 with the use of ISDN-based video conferencing from VTEL. Also in 1995, we opened our New Media Center, composed of a Faculty Development Studio and Media Distribution Center to assist faculty in learning, developing, and applying the newer multimedia technologies of that time, such as QuickTime and Adobe Premiere. Subsequent years have seen the addition of QuickCams, CUseeMe, Webcam Turbo, Real Server, Netmeeting, Media Cleaner Pro, and a variety of other authoring and production tools.

In 1998 we expanded the scope of our Fiber-Optic Video Network and began to add more robust hardware and software development resources. In 2001 we made major upgrades to our video services, with the addition of Windows Media and QuickTime servers, high-end encoding workstations, and digital video cameras, as well as portable lighting and sound equipment, and we upgraded our legacy video conferencing system with current technology by Polycom.

Into the Future: Making a New Plan for Technology

Since there has been growing interest in the use of video technology for instructional purposes, Duquesne University has a unique opportunity to optimize and capitalize on this technology by organizing its efforts into a working strategic program. Members of Computing and Technology Services, the Center for Distance Learning, Multimedia Technology, and faculty from several schools are collaborating in this planning and implementation process.

In 2001, we launched an Instructional Video Technology Subcommittee (IVTS) as a working subcommittee of the Educational Technology Committee. The purpose of the IVTS is to develop a plan for successful use of instructional video at Duquesne University. During 2001, we completed the majority of the elements in our strategic plan for instructional video:

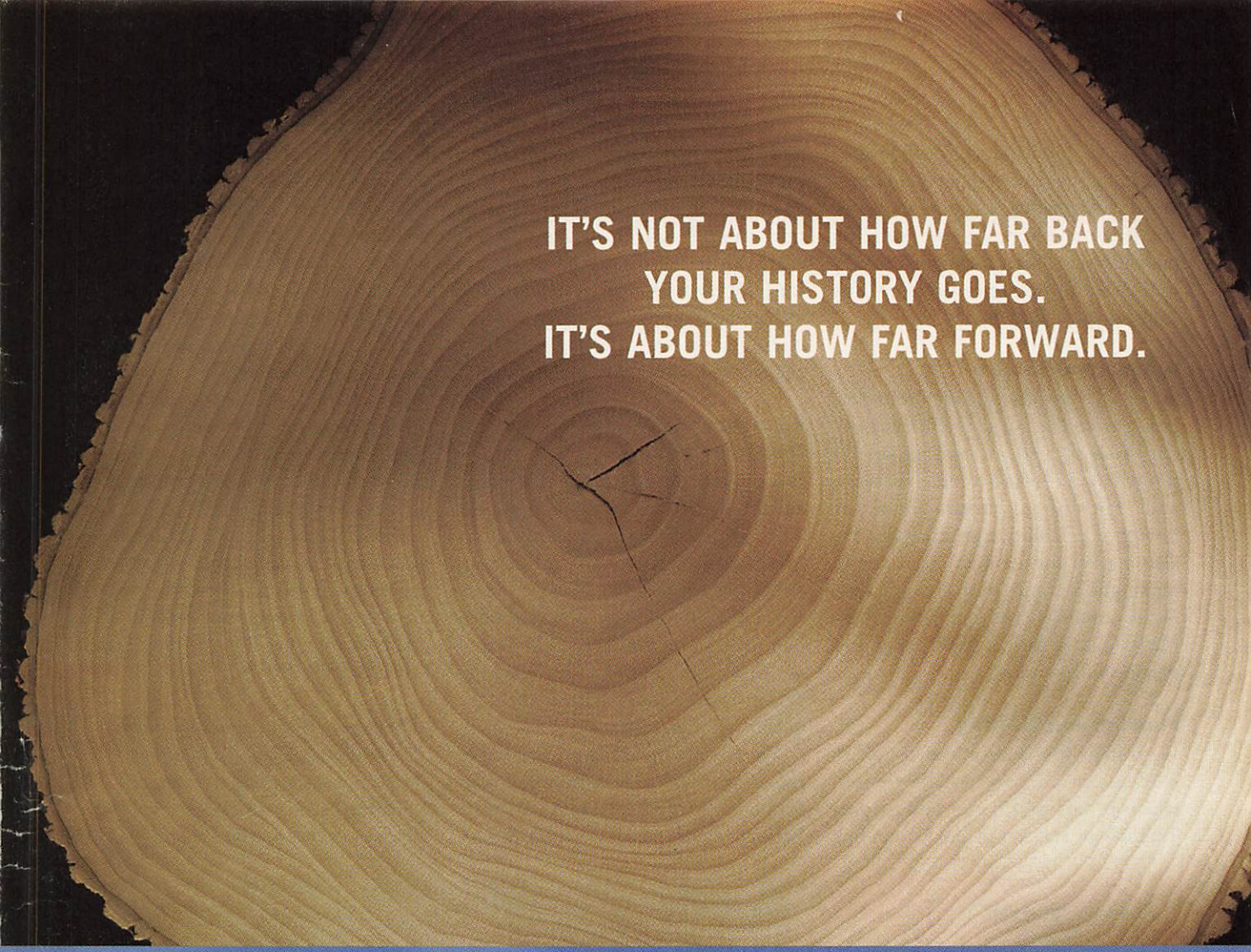
- Develop a context for scholarship, research, and sharing the results of faculty members utilizing instructional video.
- Create university standards and policies for the use of instructional video.
- Define the various types and needs of instructional video services, e.g., streaming, conferencing via ISDN, WAN H.323, and LAN H.323.
- Develop the criteria for ongoing selection and evaluation of appropriate elements in instructional video, e.g., codecs, streaming technology, network topology, formats, and architectures.
- Evaluate the need for educational consultants in the Faculty Development Studio to provide video-related services for faculty members using instructional video.
- Provide a plan to optimize video services in our network topology.
- Produce a report identifying the university's current effort in resources and dollars for the delivery of instructional video.
- Develop initiatives and workshops on instructional video pedagogy for faculty.
- Develop a strategy for current and emerging needs for distance learning use of instructional video.
- Plan for a video front end enabling WAN instructional video.
- Build a team for the ongoing assessment of emerging technologies in instructional video.
- Establish a stable production and delivery process while maintaining the capability to experiment with prototype systems.

Enhanced Equipment

To support our growth and anticipated future endeavors, current basic video equipment installations are being enhanced and services augmented to

Selected Resources for Video and Streaming Media

- Consortium of College and University Media Centers
  www.ccumc.org
- Discreet CleanerLive *(Live Web casting of Real and Windows Media Streams)*
  www.discreet.com/products/cleaner_live/index.html
- DV Video Magazine
  www.dv.com
- e-learning and Teleconference Magazine
  www.elearningmag.com
- eMEDIA Magazine
  www.emediamag.com
- iCanStream.com *(Media100 affiliate info and tutorials on QT, WM, and REAL)*
  www.icanstream.com
- Internet2
  www.internet2.edu
- New Media Centers
  www.newmediacenters.org
- QuickTime Streaming Server
  www.apple.com/quicktime/authoring/qtss
- Real Networks/Real System iQ, Real Server, Real Producer, Real SlideShow
  www.real.com
- Streaming Media Magazine
  www.streamingmedia.com
- Streaming Media World Video *(Tutorials, reviews, references, services, and more)*
  www.streamingmediaworld.com/video
- University of Wisconsin Madison, Streaming Media
  http://streaming.doit.wisc.edu
- Video Conferencing Cookbook
  www.vide.gatech.edu/cookbook2.0
- Video Development Initiative
  www.vide.net
- Windows Media Technologies, Windows Media Training
  www.microsoft.com/windows/windowsmedia/en/training/default.asp



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support the production of quality video streaming, multicasting, and Internet-based conferencing. Ongoing enhancements to the university's network are providing a robust means of quality delivery of these products to our students and end users.

Augmented Service

Added services are intended to define processes so that we gain efficiency and effectiveness. This means that we add trained staff, dedicated video servers, and encoding workstations for improved reliability and scalability. We also market the services internally to make good use of our capabilities. Faculty and staff can contact our New Media Center for consultation and to develop video projects.

Funding and Staffing

We employ four full-time staff and 16 students in our New Media Center, which is part of a larger Educational Technology division of the Computing and Technology Services Department. Funding at this time is part of our Computing and Technology Services operational budget, and we do not charge for our media development services. We have recently restructured a charge-back policy for video conferencing services, in order to reflect changes and innovations in the system.

Training and Faculty Development

If faculty are more aware of the basics and the big picture before they begin any video projects, they can collect better-quality video for post-production. Otherwise, we face the situation where they decide to reuse or Web cast video obtained under varying methods and conditions, and then they and the students are disappointed with the quality of the end product.

We already have permanent video recording hardware installed in our Law School courtrooms, Speech Language Pathology clinical observation rooms, Biology microscopy labs, and other campus locations. Departments in other disciplines, such as the School of Business, have been capturing video segments with portable cameras and placing the video onto CD-ROM for use in face-to-face classes and for replay on the Web.

Faculty members may want to do their own video project development, or they may want our New Media Center to work with them. In either case, the faculty need to know our capabilities and be able to determine which types of video can help improve teaching and learning. To facilitate these efforts, we offer ongoing overview seminars and training workshops. Faculty development is a key part of our collaborative efforts as we move into the future with instructional video.

*Allen Burnett, Ph.D., (burnett@duq.edu) is distance learning coordinator; **Don Maue** is director of computing support services; and **Edward McKaveney** is the New Media Center team leader, all of Duquesne University.*

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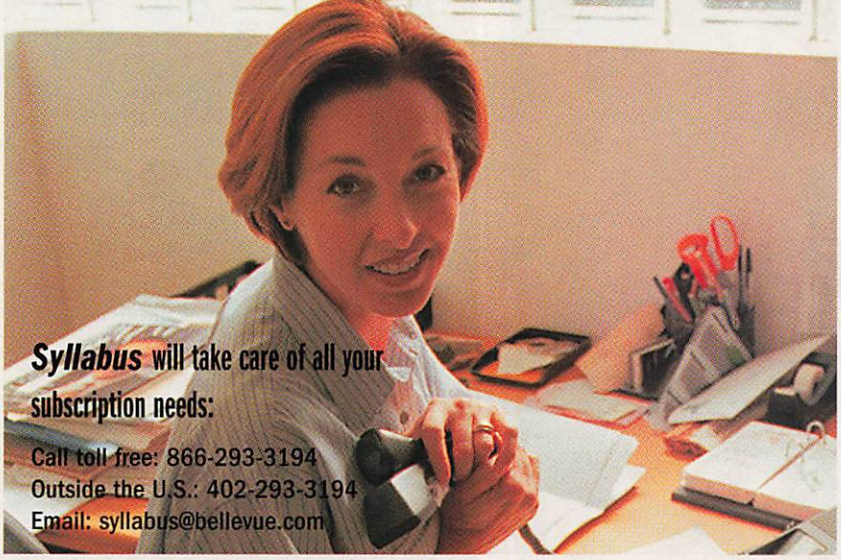

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The University of Toronto's network-attached storage system gives users universal access to documents; Video conferencing enables global collaboration at Berklee College of Music.

University of Toronto Network System Offers Storage from Anywhere

A network-attached storage (NAS) system at the University of Toronto at Mississauga has made it possible for all 6,400 students to retrieve their data from anywhere—on or off campus. In the past, students stored files on floppy disks or on servers that could only be accessed from a particular computing services location. However, many files, such as Microsoft Corp. PowerPoint presentations, are too big for floppies, and students often use different computing centers as they move around campus.

The computing services staff evaluated a range of potential solutions and selected a NAS system over a storage-area network (SAN) because it was a better fit for file serving. Now, each student has a 10 MB storage area that he or she can access from any Microsoft Windows or Unix desktop at the university or from anywhere off campus via an Internet connection.

"We have received so much positive feedback on the NAS approach that, by popular demand, we are planning to expand it to cover 250 faculty members in the near future," says Joe Lim, manager of computing services at the university. The new storage system is more convenient for students and less labor-intensive for the technical staff than the decentralized storage used in the past, he adds.

Mississauga, one of three campuses of the University of Toronto, offers degree programs in sciences, social sciences, management, and humanities and has more than 150 graduate students, predominantly in the life sciences. Students frequently use the campus' nine computing centers to prepare class assignments and conduct independent research.

With servers located at each computing center, it wasn't practical to offer each student dedicated storage on one server. Most students use multiple computing centers so offering storage at one center was a poor solution, complicated by the fact that there wasn't enough local storage to go around.

As a result, most students carried their work on floppy disks, which became increasingly difficult as average file sizes increased. Students often had to download large programs or work with graphics files that were too large to fit on a single floppy. Also, floppy disks sometimes became corrupted, and students who had neglected to back up their files had to redo significant amounts of work.

Some students tried to get around these problems by making special arrangements to store larger files at one of the computing centers, but this created administrative headaches for the staff because maintenance and backup tasks had to be repeated on multiple machines located throughout the campus.

The process of finding a solution to this problem, Lim says, led to a major debate among the technical staff. Some favored the SAN approach, in which servers are connected to storage at the block level, while others preferred the NAS approach, which connects the entire network to storage that is accessible at the file level. A consensus was reached to go with NAS because staff members concluded that it provided a simpler, more robust and more economical approach to what was, in essence, a file-serving application.

The technical staff then conducted a detailed evaluation of the leading NAS solutions. An important consideration was maintaining compatibility with the multiple computing environments used at the university, including Windows and Unix workstations and a Novell Inc. NetWare Version 4.11 local-area network.

"While no NAS system would support Novell directly, we found one—the Auspex [Systems Inc.] NetServer—that provided an innovative workaround," Lim says. "Our [Windows] NT workstations log in through Novell, and Novell mounts the NAS through Samba [Common Internet File System] emulation software. Then the NT workstations can talk directly to Samba without going through

the Novell server." Samba is an open source suite that provides seamless file and print services to CIFS clients.

The technical staff also saw value in the Auspex architecture, in which the input/output node is the fundamental building block. Each node contains an dual-processor motherboard that has logically separate processing functions. The network processor manages network protocols and associated caches. The file and storage processor is dedicated to managing file systems and associated storage hardware. The result is a dramatic improvement in performance—approximately twice as many network file system operations per second as comparable systems.

Lim and his team selected an Auspex NetServer with two 100 MB I/O ports. One is connected to a Unix Internet server and the other to a virtual LAN consisting primarily of Novell servers at the local computing centers. Each student has 10 MB of storage space that can be used for local storage and for his or her personal Web site. The system currently has 500 GB of storage space configured with RAID 5 redundancy, as well as dual power supplies.

The Auspex service team worked with Lim's staff to get the server up and running in minimal time. Plans are in place to expand the storage capacity to 1 terabyte during the next few years as the amount allotted to students rises and more members of the university community receive storage space.

Students can access their storage resources throughout the university, and they can also upload and download files from any location where they have an Internet connection. To access the files from a PC on campus, students simply log in and select Start/MyFiles or click on the myfiles icon at the top of their desktop screen. To access their files from an off-campus site via the Internet, they log in to the university's FTP site and are immediately directed to the proper directory.

The NAS solution has also substantially reduced the maintenance workload for Lim's staff. Typically, maintenance tasks such as cleaning and backing up user directories only have to be performed once at a single location, reducing the maintenance workload to a fraction of what would be needed if all students were provided storage on local machines.

Auspex NetServer offers an approach called creating point-in-time copies, which involves writing changes to a second device during a backup to ensure a clean image of the system at the time the backup began. Lim's team makes a point-in-time copy of the entire storage system every night and stores one week's worth of snapshots for access by students who may have inadvertently deleted a file.

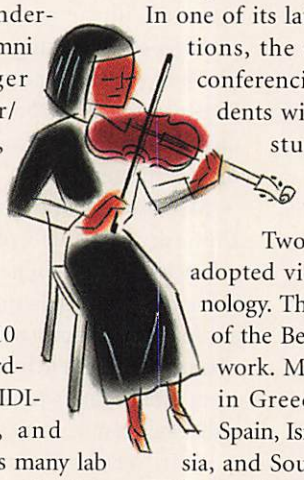
The system's performance has been excellent, Lim says. "Since the unit was installed, we have never had a single minute of downtime, nor have we ever had to call on [the company's] service staff. We have dealt enough with the people at Auspex to know that they are great to work with. They take a proactive approach by alerting us to any upgrades or possible problems."

He adds: "But the best part of implementing NAS has been the positive feedback that we have received from students who no longer have to squeeze their files onto floppy disks or try to remember which of the university's computing centers they used to store an important file. Naturally, the faculty members now want access to the same system, and we are in the process of expanding its capacity to accommodate their needs."

For more information, contact Joe Lim, University of Toronto at Mississauga, at (905) 828-5311.

Berklee College of Music: Enabling Global Music Collaboration

Boston's Berklee College of Music is the world's largest independent music college, focusing on contemporary music and music education and serving more than 3,400 undergraduate students. Berklee alumni include producer/arranger Quincy Jones, rock singer/songwriter Melissa Etheridge, film composer Alan Silvestri, guitarist and *Tonight Show* bandleader Kevin Eubanks, and jazz saxophonist/composer Branford Marsalis.



Berklee's facilities include 10 professionally equipped recording studios, more than 100 MIDI-equipped workstations, and hundreds of synthesizers in its many lab facilities. In addition, the Film Scoring Department houses six fully equipped film/video scoring and editing labs.

Technology is a catalyst for Berklee, driving classroom innovation and providing the most comprehensive music education possible. The school's mission also includes drawing on music professionals around the world to give students a comprehensive, world-class education. In one of its latest technology innovations, the college is using video conferencing to link Berklee students with musicians and other students throughout the United States and in several other countries.

Two years ago, the college adopted video conferencing technology. The catalyst was a meeting of the Berklee International Network. Members include schools in Greece, Germany, Finland, Spain, Israel, Paris, Japan, Malaysia, and South Korea. The network enables students to enjoy almost unlimited educational sessions, special events, and music performances.

For example, students can consult with music historians, collaborate with directors and composers, participate in remote

auditions, and even provide feedback on the newest symphony from as far away as Greece. The question was how more Berklee participants could attend a conference being held in Greece. Video conferencing proved to be the answer.

Since then, the college has successfully applied the technology at the classroom level. "Video conferencing is used often for a number of very successful demonstration classes, such as percussion classes and a United States-to-Greece music improvisation class," says David Lustig, Berklee's assistant vice president for information technology.

Lustig adds, "Music is at heart a collaborative art form. The technology we use should follow that mold."

Berklee has offered the Greek students six sessions of improvisation class. In return, Berklee students will be able to participate in a series of polyrhythm courses broadcast from the Greek school. Berklee also has a partnership with Dolby Laboratories Inc. in Burbank, California, that enables the school to use video conferencing technology to invite guest speakers from the Los Angeles music community to participate in Berklee classes. Its most recent guest lecture was by percussionist and Berklee honorary doctorate recipient Peter Erskine.

Using video conferencing technology to teach music requires high-quality audio and video in order to display the subtleties of tone and highlight nuances of expression without distracting delays or jitters. "This was one of the most important considerations in our search for a video conferencing solution," Lustig says. "There were rigorous expectations for the technology; not only did it have to help support this relationship, but it had to do so invisibly and without requiring any IT intervention."

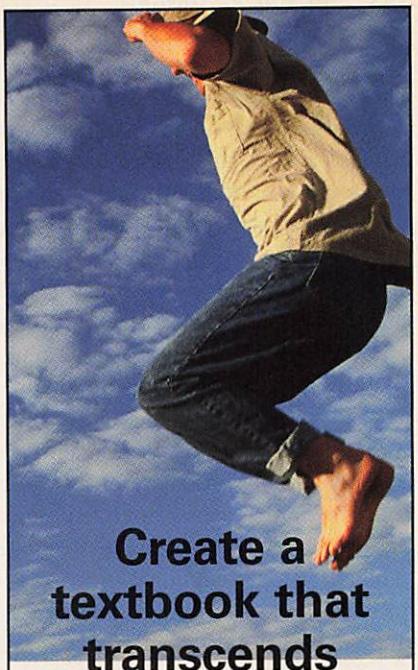
The school chose to deploy Polycom Inc.'s ViewStation 512. The system met the school's audio and video quality requirements and offered the flexibility it needed. The school often attaches its own sound speakers and microphones to the equipment to achieve the best possible result. Depending on the situation, the transmitting classroom may also use a document camera that can switch from displaying a document to displaying a roomful of people, as well as using additional cameras and sound equipment.

One drawback to video conferencing is the quarter-second delay in transmission from site to site, which can make musical collaboration challenging. However, Lustig says they simply use the technology's strengths and don't try to apply it where it can't succeed.

"We don't use video conferencing for really close improvisational collaboration," he says. "We use it for a really loose, free improvisation or for master classes."

He adds, "Moving forward, video conferencing technology will, without question, play a significant role in our commitment to expanding learning opportunities within Berklee and throughout the world."

For more information, contact David Lustig, Berklee College of Music, at (617) 747-2027.



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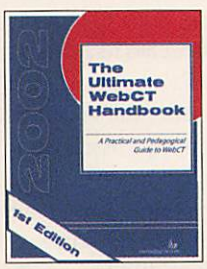

For more information, contact the authors at Georgia State University:

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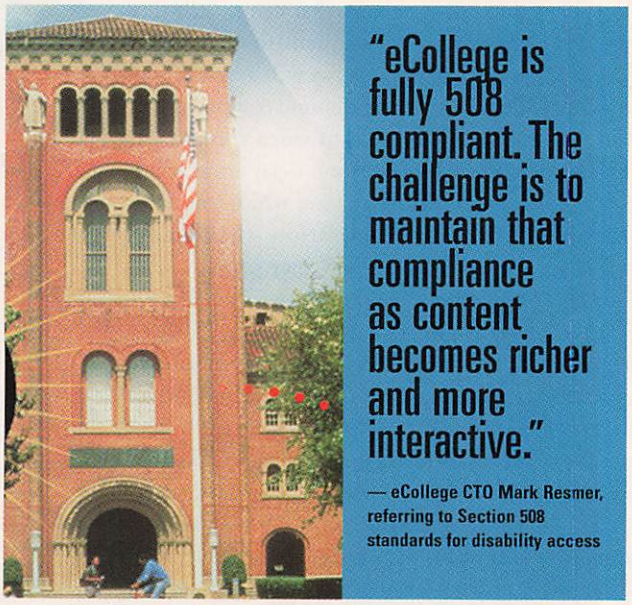
a set of applications that may best be delivered via a mobile device—course calendars, assignment listings, or any communications or messaging related to a course will be enhanced as mobile offerings. Role-based access and student data points now allow students and advisors to tailor a learning experience for the student. In the future, additional profile and learning context information will enable further personalization, e.g., a tailored curriculum can be made available to a student based on a profile correlated with various other administrative data.

WebCT is working toward a distributed content management learning object framework that allows the sharing of all types of content objects. WebCT Vista, released this past April, is a scalable enterprise technology framework with significant content management capability built in. Rich sources of learning object content, both local or external, can be managed and integrated into multiple learning contexts. "WebCT Vista is an enterprise-level platform that drives highly scaled, distributed learning implementations. It provides the integration capabilities with these extended technologies that allow us to broaden the functional base both internally and by working with partners and other external technology vendors," says Vento. "It is a critical step toward moving forward and offering new, interactive technologies that are varied and useful in the learning context."


"eCollege is fully 508 compliant. The challenge is to maintain that compliance as content becomes richer and more interactive."
— eCollege CTO Mark Resmer, referring to Section 508 standards for disability access

Element K has its roots in content development and instructional design rather than in content management systems or administrative systems. Although the company communicates that its 20-year heritage and primary focus is in teaching, instruction, and workforce training, it has built a substantial learning management system and provides a number of different eLearning products. Element K's director of product management, David Snider, explains that because the company is exclusively an ASP, its strategy is based on the assumption that all its eLearning products will be delivered over the Internet. The company's product development efforts therefore focus on improving the customer's experience on the Internet—optimizing bandwidth and designing instruction specifically for use on the Internet.

The company has shaped its instructional design strategy to take advantage of new interactive media. "With our current instructional design model, called SPARK, we've combined the very best of instructional design with experience design," Snider states. One of the first courses done in the SPARK model can be seen in a product developed with Harvard Business School Publishing, called The Harvard Interactive Manager Series. Snider says, "Aside from being very rich in interactive media, we use streaming video, branching scenarios, inline projects, and assessments. An important aspect of the SPARK model is that, included with these interactive elements, there are numerous choices of learning modes that the student can make dynamically, based on learning style and what is appropriate for the exercise at hand."

VLabs ("Virtual Labs") serve as another example of how Element K incorporates different types of interactive elements into instructional design. For the study of Information Technology, it can be a challenge to get access to live equipment on which to learn to solve real problems. In addition to simulations, Element K uses real equipment which is "scrubbed" and then set up in a particular configuration for use in the problem scenario.

Snider adds that since the company is a content developer, it is also in a unique position to offer services to customers who wish to develop their own interactive content for the Internet.

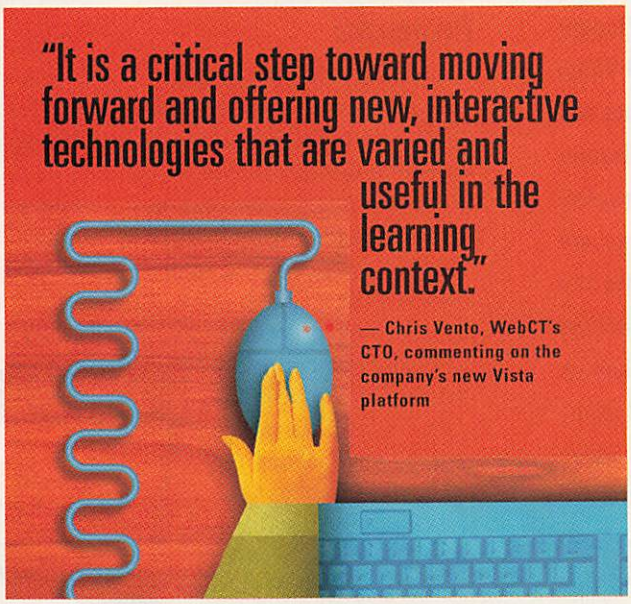
Jenzabar CEO Bob Maginn relates the vision upon which the company was founded: to enhance higher education through the introduction of an online community and online learning technologies via the Internet, and to integrate administrative data and functions. The company soon grew to include both a portal gateway and a course management platform. "The Jenzabar strategy evolved into what we call I^3: Internet, Intelligence, and Integration," says Maginn. "In order to draw people into using technology, they have to find it to be useful in their daily lives—powerful and meaningful in advancing whatever goals they are trying to accomplish."

Maginn cites an example pertaining to how the I^3 strategy supports interactivity. "You have to have all three elements," says Maginn, "You have to have the Internet and accessibility, you have to have Intelligence in the system, and you have to have Integration with what is already built into the enterprise software and database layer on campus." A junior wanting to find out what courses to take in order to work toward graduation might use a handheld device to interact with schedules, calendars, and program information, and then register for selected courses. This is an intelligent, integrated system: in order to provide the proper information to the student, the system has to access a database to find out which courses the student has already taken; it must find the requirements in terms of the courses the student must take to complete a given major, and in what sequence; it has to know the schedule of what classes will actually be offered and available; and it needs access to a calendar to push the information onto to make sure there are no conflicts. When the student is ready to register, the system must also facilitate that process. This scenario

also requires having an Internet gateway, and mobile computing environment.

This integrated, interactive environment can be extended to other constituent groups, such as faculty, staff, and administration. Jenzabar offers Constituent Relationship Management engines that take advantage of its I^3 strategy to enable complex interactions—the example above is just the beginning.

SCT senior vice president Anne Keough Keehn explains that the 34-year-old company, once considered primarily an administrative systems vendor, is now looking to provide an entire e-education infrastructure to unify teaching, learning, and administration. "Much of the transformation of higher education has taken place on the learning side," says Keehn. "The way administrative systems have to evolve is to determine what will help administer teaching and learning. We believe that an e-education infrastructure is needed to leverage both the course management system and administrative system to provide more user-centric experiences to the different constituencies, including faculty, students, alumni...the entire community."


"It is a critical step toward moving forward and offering new, interactive technologies that are varied and useful in the learning context."
— Chris Vento, WebCT's CTO, commenting on the company's new Vista platform

The types of interactive applications now being developed by SCT center around self-service and anywhere access. In the broader view, this may be considered Web enterprise management. As an example of a specific application, Keehn cites the newly launched E-Recruiter Pocket PC—an interactive tool for college admissions recruiters, accessed via a handheld device—and she states that similar applications will be developed for students and other user groups.

One key technology area is content management. Rich multimedia content, robust streaming video, and other interactive media assets can be leveraged in a content management system. Sharing and learning asset management will be counted among the elements of a total e-education infrastructure.

The problem of integration is also key. The ability to serve up not only course information, but also administrative information in an integrated system will be a user expectation and an area for continuing development. Interoperability of the tools and interactive technologies across campus is part of this integration and will include common calendar, e-mail, and course management systems.

For future development, additional areas to watch include collaboration and community-building technologies. Keehn notes that technologies developed by the gaming industry along with real-time, persistent connections for interactive multi-user environments may ultimately contribute in these areas. "This can also be seen from an administrative standpoint." Keehn points out. "As people are interacting more and more online, it's important to consider how best to provide that capability and create communities of interest online."

Campus Pipeline defines itself as an infrastructure player. David Murray, CTO, and Darin Gilson, COO, share their views on implementing new interactive technologies on campus. "We are excited and anxious to see these emerging technologies and to find out how they are going to take hold in the education market, but first and foremost, our focus is on building the infrastructure from which the technologies can be deployed," says Gilson, "And that is the chasm that needs crossing right now in higher education—making sure that the infrastructure is suitable for the broad deployment and development of new technologies." A tremendous amount of activity has already been made possible by Internet-based architectures, and that will continue at an accelerated pace into the future. But Campus Pipeline sees its role as helping schools build the foundations and the infrastructure upon which they can build their digital campus.

Infrastructure might not seem very tangible at first to many constituents, who will be concerned with their immediate needs for specific applications. "But the purpose is for all of the different applications to be deployed and delivered in a manageable fashion," says Gilson. "If you start at the application level, without having that common foundation in infrastructure, you are going to create a 'soup sandwich,' and obviously that is what needs to be avoided."

One technology area that is of particular interest is security. "People are grappling with security issues—not just surrounding the initial login, but across all different applications," noted Murray. How credentials are managed, what the points of vulnerability are, and how to determine the right tradeoff between security and convenience are among the top concerns.

Whereas the technology decision is critically important, the decision is as much about the function of the technology as about the technology itself. "Getting technology in place and implemented is the easy part—what is more difficult is to have that technology accepted as part of the fabric of the institution, seeing that all the constituents understand how they can take advantage of it, and finally to find that it is truly delivering for the mission of the institution," says Gilson. "It is remarkable to see the difference in results of technology implementation between schools that take a mission-oriented approach versus schools that take a very technology-centric approach. The returns are vastly greater to those who have a broad vision of what the technology can accomplish if deployed correctly."

PRESENTATION TECH MEETS THE NETWORK

Presentation Systems

Presentation technologies, from projection systems to whiteboards, are no longer orphan technology, difficult to manage and operate and cut off from their information and graphical sources. Today, these systems are being integrated into the information technology enterprise like never before, with the result that many projectors more often resemble fast network computers than optical systems. To illustrate this trend, *Syllabus* has picked a few examples of the latest presentation hardware and software. Together, they show convincingly that traditional presentation systems have now become sophisticated local-area network and even wireless network appliances.

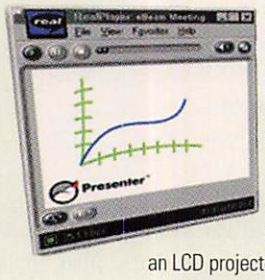
InFocus DP8000 Large Meeting Room Projector

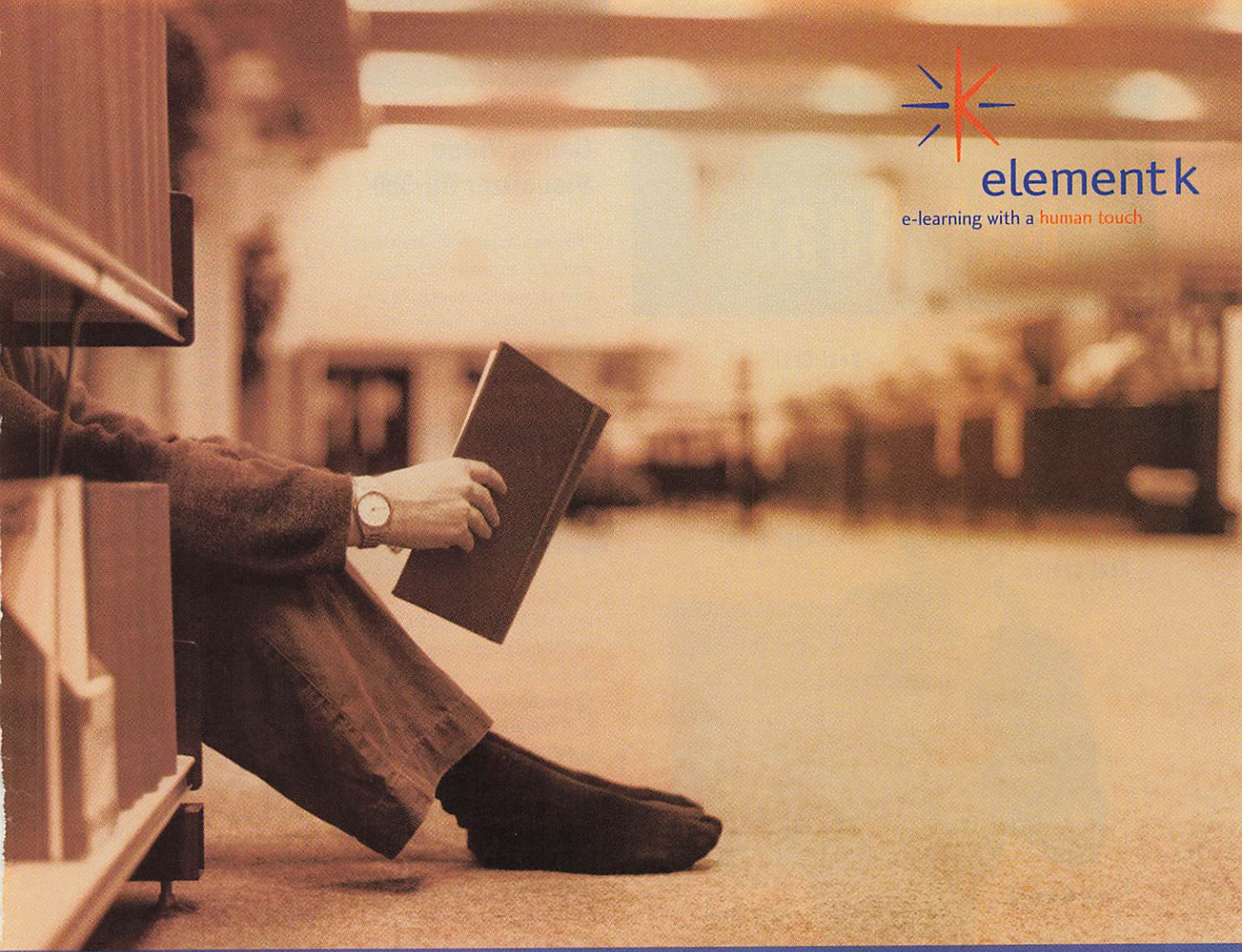
InFocus claims to offer the new era of networked projection systems by turning its projectors into IT products. This network-ready system backs up that claim. The InFocus/Proxima DP8000 offers built-in networking capabilities that support the emergence of projectors as managed assets on the corporate network. This, in turn, helps IT departments reduce the total cost of projector ownership. The projector offers support for the High-bandwidth Digital Content Protection (BDCP) standard, which allows straight digital-to-digital signals. The unit features native XGA resolution and 3,000 lumens of brightness, and weighs in at 13.2 pounds. In addition to Web and video conferencing, the DP8000 can be used to view DVD, HDTV, digital photos, and other digital content geared toward e-learning and distance learning.

The projector works through network-management standards such as Microsoft Management Console to enable administrators to configure and control the projector—or a fleet of projectors—from a remote console. Contact: InFocus Corp.; (800) 294-6400; www.infocus.com.

E-Beam Portable Whiteboard

Whiteboard users looking for a portable solution will want to check out e-Beam from Electronics for Imaging. E-Beam lets you print to a local printer without a computer connection, or "beam" the notes to a Palm OS handheld unit. It also offers the convenience of capturing your whiteboard data using a PC or Mac. Despite its focus on portability, e-Beam still offers an array of features. Users can print whiteboard notes; capture lecture scribblings for after-class routing via PDF, JPEG, or HTML; make classroom presentations using an LCD projector and the e-Beam mouse; or replay whiteboard drawings using the play controls. Users can adjust the size or color of the image captured. The nifty design includes special sleeves and erasers. These send out an electronic signal to the system giving a location as well as color. Users simply pick up a sleeve or the eraser and begin writing or erasing. E-Beam mouse understands the sleeve signals. The two receivers mount onto the whiteboard inconspicuously and enable users to capture a surface as large as 8 feet by 5 feet. Contact: Electronics for Imaging, e-Beam Division, Foster City, Calif.; (650) 357-3500; www.e-beam.com.





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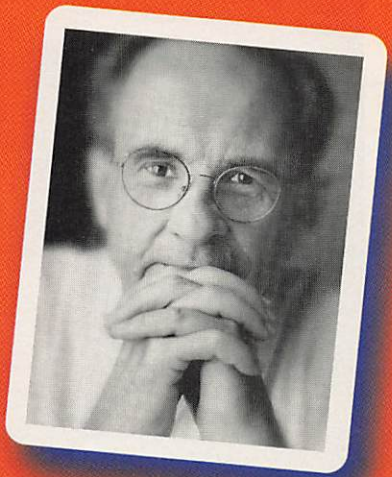

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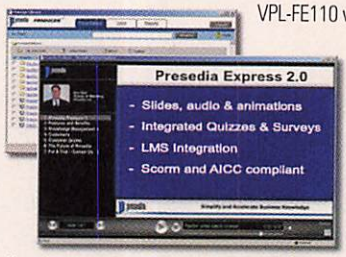
Canon Video Visualizer RE-350

The Video Visualizer RE-350 allows instructors to display and project three-dimensional objects, as well as high-resolution images such as photos, slides, and X-rays, including larger then normal sizes. Integrated

with a VCR and a computer, the RE-350 frees classrooms from the old overhead projector and opens up possibilities for displaying all sorts of artifacts: works of art, tools, anatomy specimens, and more. All of RE-350's necessary controls are located on the front panel, making the system extremely convenient to use. Canon also offers a Remote Control Box and Controller, giving users added flexibility and freedom of movement. Contact: Canon USA; (800) OK-CANON;www.canonprojectors.com.

Presedia Express 2.0

Presedia Express is a content management system designed to quickly and efficiently move content from the creator to the user. Consisting of a content manager, transcoder, transform engines, and delivery manager, Presedia allows users to capture, manage, and deliver Web presentations and quickly convert PowerPoint presentations into online multimedia teaching tools. Version 2.0 adds many new features, including an easy-to-use interface that enables AICC-compatible quizzes and surveys to be quickly added into any PowerPoint slide. Other key enhancements include extended animation support, an audio import utility, and a visual audio editor. The system automatically tags specific text within each PowerPoint slide to enable intelligent search capabilities. Key to Presedia's strategy is capturing data in chunks, breaking up the material into its constituent elements—text, graphics, audio—and storing these elements in XML. The XML data can then be searched, combined, and rebuilt for proper display on various output devices such as Web browsers, personal digital assistants, CD-ROM, and smart wireless phones. Contact: Presedia, Sunnyvale, Calif.; (408) 616-0050; www.presedia.com.



Sony VPL-FE110 Wireless Projector

The start of the art in presentation hardware is moving in the direction of—you guessed it—wireless. Why? More and more projectors are being connected to networks, wired or wireless, to access users across the enterprise and to distribute content. The reduced cost and hassle of using cables are just added bonuses. Sony's VPL-FE110 wireless projector includes an internal Windows CE operating system, which enables it to display Microsoft Word, Excel, and PowerPoint presentations and JPEG and GIF files, as well as browse the Internet. For connection to a local-area network, it features a PC Card Type II slot for wireless and wired Network Interface Cards, as well as Memory Stick or Compact Flash cards

for memory storage of 30 MB of information. Users can send the projector presentation files by connecting a PC to the LAN. Windows CE enables the projector to be accessed from anywhere via a simple Web browser. This enables service providers to check the current lamp life and overall status of the projector, and allows users to download presentations from anywhere in the world. Contact: Sony Corp.; www.sony.com.

Panasonic PT-L711XNTU Wireless Projector

Wireless presentation technology may make cabling and networking simpler, but it has a huge additional organizational benefit. Remote command and control features allow multiple users to collaborate transparently in giving presentations. Panasonic's PT-L711XNTU wireless projector enables users to transmit data using the Wi-Fi (802.11b) standard when an optional wireless LAN card is inserted into a PC and to remotely check the projector's status and diagnose and fix problems. With no need for a cable connection, users can control continuous presentations from multiple PCs. A single PT-L711XNTU can be connected to and receive data from several PCs, with no need to switch input settings. This expands usability by allowing for participatory sessions—with users taking part in a presentation on their own PCs. The Panasonic unit comes with a CD-ROM that includes a Wireless Manager, which allows presenters to save images displayed from a connected PC and send them to the projector during a presentation, and a JPEG Converter utility, which converts BMP or TIFF images and Microsoft PowerPoint files into JPEG images for storage. Contact: Panasonic; www.panasonic.com/PBDS.

Iogear Phaser Handheld Radio Mouse

What do you get the untethered faculty member who has everything? How about a wireless mouse? Iogear Inc.'s Phaser is the first PS/2 handheld radio mouse with a built-in laser pointer. The device enables presenters to highlight material or direct audiences to specific locations with its light beam. The wireless tool can be controlled up to 50 feet from the computer. Using high-band radio waves, the Phaser also provides accurate cursor movement. The product, priced at $59.99, has a contour design that comfortably fits the shape of the hand. The mouse is Windows-compatible and comes with a three-year warranty. Later this year, the company will release a combination version of Phaser that will be USB- and PS/2-compatible. Contact: Iogear Inc.; (949) 428-1111; www.iogear.com.

Kurzweil 3000 Assistive Reading Software

The National Institutes of Health estimates that 15 percent of the U.S. population, or 34 million Americans, has some form of learning disability. For some of them, Kurzweil systems mean the difference between an education and a world of ignorance. The Kurzweil 3000 software helps people with reading or learning difficulties increase their

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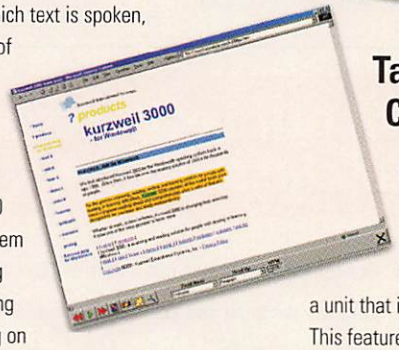
reading speed and comprehension. The system uses a multisensory approach—presenting printed or electronic text on the computer screen with added visual and audible accessibility. The product includes dynamic features designed to adapt to each individual's learning style and minimize frustration for both the learner and educator. For instance, the Kurzweil 3000 offers the reader the ability to control the speed at which text is spoken, the increments of words being read and highlighted, and the reader's personality. Version 6.0 of the 3000 system includes floating licenses, enabling students can log on anywhere, whether in the lab, classroom or library; a pronunciation editor that allows global changes in the synthesized pronunciation of words; auto-correction of OCR errors; PDF file access; and support for Windows XP. Contact: Kurzweil Education Systems Inc.; (800) 894-5374; www.kurzweiledu.com.



Sharp Notevision M25X Wireless Projector

Sharp Electronics Corp.'s flagship entry into the wireless projector market is the Notevision M25X, which uses IEEE 802.11b wireless LAN technology and image compression to enable real-time data transmission via a wireless network. The M25X also features Wireless Reality Presentation technology based on a new vector quantization (VQ) technology that makes it possible to compress and decompress still images with high compression rates and high image quality. Like the other systems listed, the M25X allows users to transmit from multiple PCs to a single projector or from a single PC to multiple projectors, without having to plug and unplug connecting cables. In addition, the M25X's memory card slot is compatible with a wide variety of cards, letting users deliver presentations directly from the projector without needing an accompanying notebook or PC. The lightweight projector weighs in at 5.8 pounds and features native XGA resolution and 1,900 ANSI Lumens brightness. The projector benefits from Sharp's CV-IC System II, a video-processing chip that cleans up jagged edges, minimizes image noise, and implements keystone corrections. Contact: Sharp Electronics Corp.; (888) 467-4277; www.SharpLCD.com.

Tandberg 550 Video Conferencing System

Tandberg, a Norwegian company specializing in video conferencing systems, has taken an early position in the wireless sweepstakes, releasing a unit that includes a slot for wireless LAN cards. This feature enables the Tandberg 550 system to be used as a shared office resource. The simple cabling requirements of the system enable it to be used in any available office space with a wireless LAN, providing all users easy access to video conferencing. The 550 also provides standards-based embedded encryption, allowing research teams to protect their intellectual property by ensuring the secure transmission of audio, video, and electronic data during a video conference on public networks. Another key feature of the 550 is the PC SoftPresenter, letting users show PC files and presentations in real time. This feature allows users to step through the slides of a PowerPoint presentation using a remote control, with no need to use a PC mouse or keyboard. The VGA output support enables these documents and presentations to be seen at their full resolution. The Tandberg 550 runs up to 384 kilobits/sec on ISDN or 768 kilobits/sec on IP. For wireless LAN environments, the system supports standard PC Cards, such as those from Cisco, Compaq, and Lucent. Contact: Tandberg; www.tandberg.net.

3M Wall Display/ Ideaboard

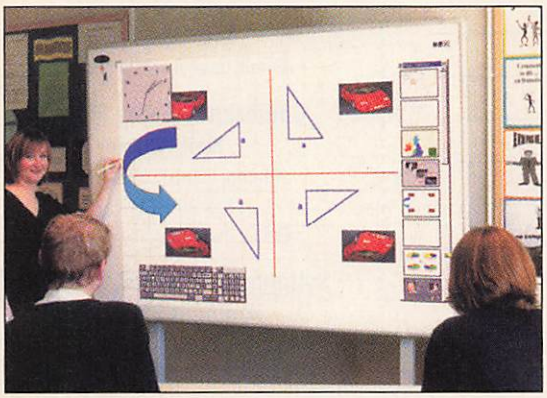
3M's Visual Systems Division's flat-screen Wall Display presentation system is a one-solution system for your display requirements. According to 3M, the Wall Display eliminates the need for a television monitor, dry-erase board, multimedia projector, flip chart, screen, and digital whiteboard and is appropriate for classrooms, small to medium conference rooms, and executive offices. The system can be used as a digital whiteboard by incorporating 3M Ideaboard software. The Ideaboard application enables users to capture notes in color and save or send them in various file formats; print notes directly from the screen when using as a copyboard; and broadcast notes in real time to remote participants. Ideaboard is compatible with Microsoft NetMeeting. A "playback" feature allows session participants to "rewind" and replay all drawings on the board, including erased items. Contact: 3M Corp.; (800) 488-4954; www.3M.com/walldisplay.

Plus Vision V-807 Digital Projector

The smallest digital projector we found, the Plus Vision V-807, weighs about 2 pounds. The system, about half the size of a typical magazine cover, is ideal for faculty road warriors. The projector matches subnotebook PCs in compactness, featuring built-in functions for mobile presentations and a full-function remote control card. Yet even with the drop in weight, the company has tried not to sacrifice robust features. The V-807 hosts Picture-in-Picture, 4-Way keystone correction, an extensive on-screen menu, and a DVI interface. The projector features auto-detect inputs that automatically identify and project RGB and video input sources, a built-in progressive scan converter, and a short throw lens that allows users to place the projector close to the projected image. Contact: Plus Vision; (800) 211-9001; www.plus-america.com/v807.html.

Promethean ACTIVboard

Promethean's ACTIVboard is a combination of digital whiteboard technology and classroom-friendly software. A cordless battery-free pen transfers multimedia lesson materials onto the large ACTIVboard screen. (Two pens are provided.) Instructors can interact with the whiteboard using the pen or remote control via the ACTIVslate, opening up options for group work and collaboration. The ACTIVslate, an A5 graphic tablet, operates remotely with the ACTIVboard. It frees instructors and students from having to stand at the board for presentations. In a classroom, there might be one ACTIVslate that is passed around or one at every workstation or desk. Promethean's software package ACTIVstudio, controlled via the pen, adds functionality that makes the whiteboard a suitable replacement for acetates, flipcharts, and slide projectors. At its most basic level, ACTIVstudio simulates a dry-erase marker or chalk, but with the added capability of multiple colors and line thicknesses. ACTIVstudio also can deliver Web content and other digital resources from the PC, and users can then highlight, annotate, and mark the text with special effects. Promethean also sells handheld keypads embedded with analysis software. The product, called ACTIVote, allows each student in a classroom to respond individually to teacher prompts. Designed to promote student interactivity, the individual keypads can be programmed to deliver anonymous or identified responses. Contact: Promethean, Lancashire, England; 0870 2413194; www.promethean.co.uk.



Smart Technologies Concept Mapping Software

Smart Technologies, a leader in the interactive whiteboard market, is taking a technique recognized by learning theorists as a way for students to brainstorm and organize their thinking, and translating it into a technology tool. Instructors can use the company's Smart Ideas 3.0 concept-mapping software for Windows to diagram abstract concepts with labeled symbols and connectors. Students can use it to plot lab reports, book reports, or essays. The software's interface enables users to preview and expand diagrams and link to more information. One innovation of the Smart Ideas software is the addition of multilevel diagrams. Teachers and students can use the software to build in three dimensions, not just two, creating sublevels and moving freely among them. In addition, users can attach live Web links, files, movie clips, and presentations to symbols, thereby making the concept map a multimedia tool. Templates and clip art are provided with the software. Users can save, e-mail, post to a Web site, or distribute files via an intranet. Smart Ideas concept-mapping software is optimized for use with a Smart Board interactive whiteboard. The board can be written on with the use of a mouse, pen, or finger. Contact: Smart Technologies, Calgary, Alberta, Canada; (888) 42S-MART; www.smarttech.com.

Epson PowerLite 600p Multimedia Projector

For educators looking for power and portability in a projection system, the Epson PowerLite 600p multimedia projector weighs in at 9.6 pounds and features substantial brightness of 1,700 lumens in native SVGA resolution. The unit uses a 0.9-inch high-aperture LCD to produce rich colors across the entire screen and a 400:1 contrast ratio for sharp blacks and whites and crisp text. The projector features six projection modes that are user-selectable based on the projection environment. The model is designed to provide quiet operation (38 db), including five-watt amplified sound for clear audio output that can fill an entire room. The Epson 600p is among the first projectors to meet Microsoft Windows color quality specifications using a color management technology developed jointly by Epson and Mitsubishi. This makes it possible for the projector to reproduce the same natural color tones as monitors. Contact: Epson; (800) 463-7766; www.info.epson.com.

Elmo HV-7000SX Presenter

The Elmo HV-7000SX with SXGA output uses digital signal processing technology and is ideal for direct connection to LCD projectors. The presenter is equipped with wireless remote control and allows full page viewing with eight or 10 points. The HV-7000SX is designed for use in conference rooms, lecture halls, and auditoriums. It delivers true SXGA resolution of 1.5 million pixels with a 1/2-inch Progressive-Scan CCD. It provides an analog RGB (SXGA-75 Hz, 7.5fps) output and digital interface USB (high-speed image transfer). It has a high quality 10x optical zoom with 2x electronic magnification.

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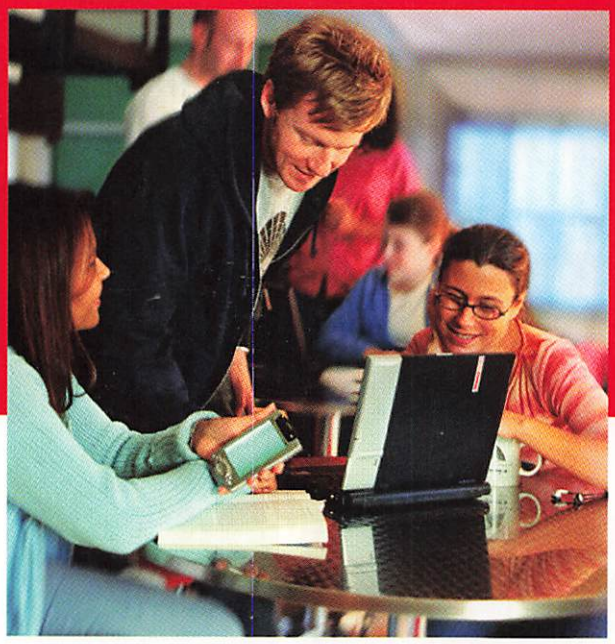

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